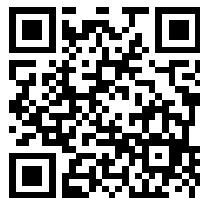

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**EASTERN ARCHIPELAGO PILOT.
PART II.
(WESTERN PART.)
THIRD EDITION, 1913.**

CAUTION WHEN APPROACHING BRITISH PORTS.

(To be inserted inside cover of all Sailing Directions.)

PART I.—CLOSING OF PORTS.

(1) My Lords Commissioners of the Admiralty having taken into consideration the fact that it may be necessary to forbid all entrance to certain ports of the Empire, this is to give Notice that on approaching the shores of the United Kingdom, or any port of the British Empire, a sharp lookout should be kept for the signals described in the following paragraph, and for the vessels mentioned in paragraph (4), Part II., of this Notice, and the distinguishing and other signals made by them. In the event of such signals being displayed, the port should be approached with great caution, as it may be apprehended that obstructions may exist.

(2) If entrance to a port is prohibited, three *red* vertical lights by night, or three *red* vertical balls by day, will be exhibited in some conspicuous position in or near to its approach, which signals will also be shown by the vessels indicated in paragraph (4), Part II., of this Notice.

If these signals are displayed, vessels must either proceed to the position marked "Examination Anchorage" on the Admiralty Charts and anchor there, or keep the sea.

PART II.—EXAMINATION SERVICE.

(3) Under certain circumstances, it may become necessary to take special measures to examine vessels desiring to enter the ports or localities at home or abroad, referred to in Notices to Mariners No. 1 of 1916 and subsequent years.

(4) In such case, vessels carrying the distinguishing flags or lights mentioned in paragraph (6) will be charged with the duty of examining ships which desire to enter the ports and of allotting positions in which they shall anchor. If Government vessels, or vessels belonging to the local port authority, are found patrolling in the offing, merchant vessels are advised to communicate with such vessels with a view to obtaining information as to the course on which they should approach the Examination Anchorage. Such communication will not be necessary in cases where the pilot on board has already received this information from the local authorities.

(5) As the institution of the Examination Service at any port will never be publicly advertised, especial care should be taken in approaching the ports, by day or night, to keep a sharp lookout for any vessel carrying the flags or lights mentioned in paragraph (6), and to be ready to "bring to" at once when hailed by her or warned by the firing of a gun or sound rocket.

In entering by night serious delay and risk will be avoided if four efficient all round lamps, two *red* and two *white*, are kept available for use.

(6) By day the distinguishing flags of the Examination Steamer will be a special flag (white and red horizontal surrounded by a blue border) and a blue ensign.

Also, three *red* vertical balls if the port is closed.

By night the steamer will carry: (a) Three *red* vertical lights if the port is closed; (b) three *white* vertical lights if the port is open.

The above lights will be carried in addition to the ordinary navigation lights, and will show an unbroken light around the horizon.

(7) Masters are warned that, when approaching a British port where the Examination Service is in force, they must have the distinguishing signal of their vessel ready to hoist immediately the Examination Steamer makes the signal.

(8) Masters are warned that, before attempting to enter any of these ports when the Examination Service is in force, they must in their own interests strictly obey all instructions as to entry given to them by the Examination Steamer. In the absence of any instructions from the Examination Steamer they must proceed to the position marked "Examination Anchorage" on the Admiralty Charts, and anchor there, or keep the sea.

Whilst at anchor in the Examination Anchorage, Masters are warned that they must not lower any boats (except to avoid accident), communicate with the shore, work cables, move the ship, or permit anyone to leave the ship, without permission from the Examination Steamer.

(9) In case of fog, Masters of vessels approaching the Examination Anchorage must proceed with the utmost care, and with caution.

(10) Merchant vessels when approaching the Examination Anchorage are specially cautioned against making use of private searchlights, and are warned that they must be ready to show their lights by day or night.

(11) The pilots attached to the Examination Steamer will be guided by the regulations to be followed.

8

(To face Cautionary Notice in all Sailing Directions.)

**NOTATIONS OF SUPPLEMENTS AND ANNUAL
SUMMARIES OF NOTICES TO MARINERS
RELATING TO THIS BOOK.**

To be filled in by Navigating Officer.

[In Chart Dépôts the two first columns are alone to be filled up.]

Title.	Date of Publication and Number.	Whether pasted in or noted in Margins of Book, and Date of each Correction.



NOTICE.

HYDROGRAPHIC DEPARTMENT, ADMIRALTY.

IN January of each year the information affecting this book, which has been published during the preceding year in the Admiralty Notices to Mariners, is compiled and issued as a separate publication. If a supplement has been issued during the year, this publication will only include Notices issued since the date of the Supplement. Mariners are advised to procure copies of these publications. They can be obtained gratuitously from the Admiralty Agent or Sub-Agents for the sale of charts on presentation of the coupons on the next page, either personally or by letter. In the latter case the cost of postage must be enclosed.

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EASTERN ARCHIPELAGO

PILOT, PART II.

1913.

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PILOT, PART II.

1913.

Supplement to

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1913.

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Eastern Arrivals
First Part II
1913

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EASTERN ARCHIPELAGO PILOT,

PART II.

(WESTERN PART),

COMPRISING THE

SOUTH COAST OF SUMATRA, JAVA, ISLANDS
EAST OF JAVA, SOUTH AND EAST COASTS
OF BORNEO, AND CELÉBES ISLAND.

THIRD EDITION, 1913.

ALL BEARINGS ARE TRUE.

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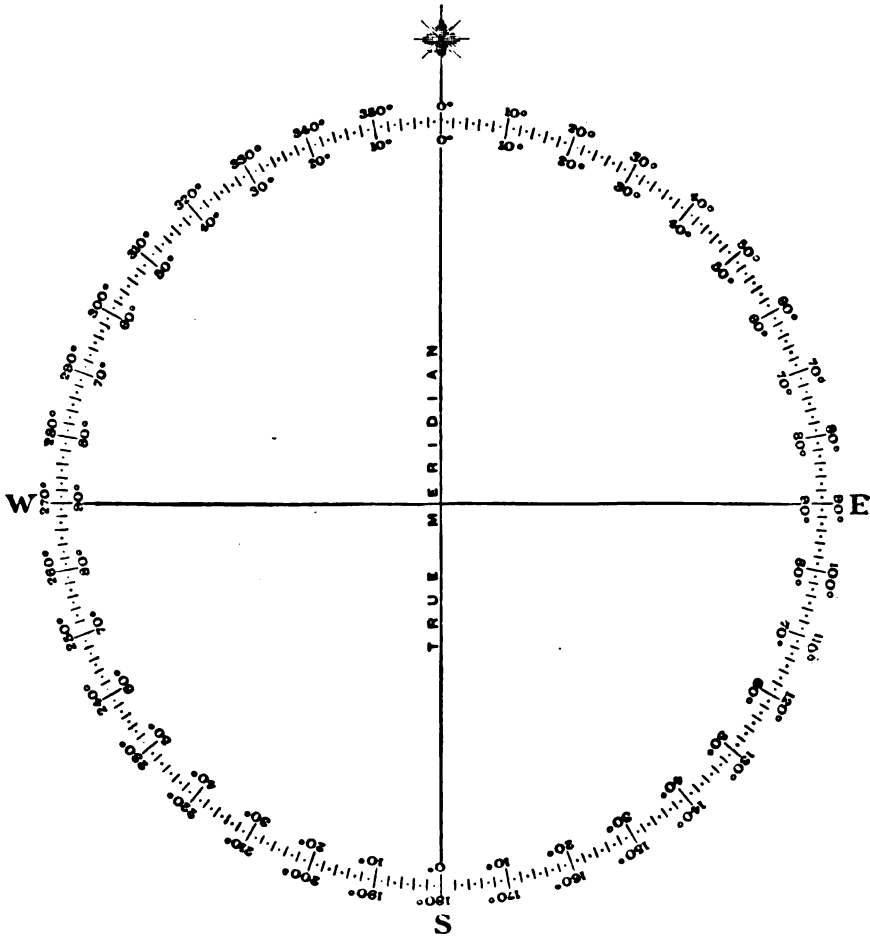
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TRUE BEARINGS.

Diagram to facilitate the conversion of True Bearings expressed in degrees of the circle from 0° to 360° into True Bearings expressed in degrees of the quadrant from 0° to 90° .



ADVERTISEMENT TO PART II.

The Eastern Archipelago Pilot consists of three parts:—Part I. comprises the North-eastern part of the Archipelago; Part II. the Western part; and Part III. the South-eastern part.

The general descriptions of places in the first chapter of this work are derived from the Descriptive Dictionary of the Indian seas, by J. Crawford; Malay Archipelago and Australasia, by A. R. Wallace; and from various documents in the possession of the Hydrographic Department of the Admiralty.

Winds, weather, and currents are from "Navigation of the Indian ocean, China and Australian seas," by Captain A. B. Becher, R.N.; the Admiralty wind and current charts; with logs and remark books of H.M. Ships; also very largely from "Wind and weather, currents, tides and tidal streams, in the East Indian Archipelago," compiled from the log books of ships of war from 1814 to 1890, by Dr. J. P. Van der Stok, Director of the Batavia observatory.

Tides and tidal streams have been observed systematically at a number of fixed points in the Archipelago, but much more information is still required to make clear the tidal system of these parts. The character of tidal movements will be found to differ greatly at places but a short distance apart, and isolated statements must be regarded as applying to very limited areas.

Geographical positions have been telegraphically determined for many points in Java, Borneo, Celebes, and neighbouring islands, but with exception of Java and Madura, Makassar strait, and detached portions of Borneo, and Celebes, where surveys are still in progress, no connected surveys of these seas have been made. Present charts have therefore been largely compiled from ancient records, and from observations and accounts obtained under very varying conditions; the greatest caution is consequently needed when sailing over such comparatively unknown waters.

Much general information has been obtained from official notices and statistical publications issued by the Netherlands Government, from diplomatic and consular reports, and from the officers of H.M. Ships.

The first edition of this volume, published in 1893, was compiled by Rear-Admiral J. P. Maclear from various sources. The second edition was prepared by Captain G. A. Browning, R.N. The present, the third, edition, was commenced by Lieut. I. Mackenzie, R.N., and has been completed by Commander H. S. Penn, R.N.

In this work all bearings are true, and measured in degrees from 0° (North) clockwise to 360°.

Mariners and others are invited, in the interests of navigation, to forward to the Hydrographer, Admiralty, London, S.W., any information that may come under their notice, which would be useful for the correction of the Charts and other Hydrographic Publications issued by the British Admiralty; early advice as to newly discovered dangers, the establishment of, or changes in, any aids to navigation is specially requested.

Copies of a form (H. 102) on which to render information can be obtained gratis from the Admiralty Chart Agent—

Mr. J. D. Potter,

145, Minories, London, E.C.,

or of any of his Sub-Agents in Great Britain and abroad.

By the publication of this volume, the second edition of *Eastern Archipelago, Part II.*, Revised Supplement, 1909, and all Notices to Mariners relating to that work, up to and including No. 1,457, of 1913, are cancelled.

H. E. P.-C.

*Hydrographic Office,
Admiralty, London,
2nd October, 1913.*

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**GLOSSARIES OF WORDS OCCASIONALLY FOUND IN THE
CHARTS AND SAILING DIRECTIONS.**

J A V A - M A L A Y .

Java-Malay.	English.	Java-Malay.	English.
Alang alang -	Reeds.	Labuan - -	Anchorage.
Angin - -	Wind.	Lama - - -	Old.
Api - - -	Fire.	Laut - - -	Sea.
Arus - - -	Current.	Layar - - -	Sail.
Ayer - - -	Water.	Lehok - - -	Bay.
— masin -	Salt water.	Lor - - - -	North.
— pasang -	Flood or high tide.	Lumpur - -	Mud.
— surut -	Ebb or low tide.	Muara - - -	Mouth of a river.
— tawar -	Fresh water.	Napo, or Napo napo	Reef.
Baharu - -	New.	(on north coast	
Bambu - -	Bamboo cane.	of Célebes).	
Batu - - -	Rock, stone.	Nipa - - - -	Small marsh palm.
— Arung -	Coal.	Nisa, Nusa -	Island.
Besar - - -	Large, great.	Padi - - - -	Rice in the straw.
Besi - - - -	Iron.	Pandoman -	Mariner's compass.
Beting - - -	Shoal, sand.	Panjang - -	Long.
Burnung - -	Bird.	Pasie (on west coast	Reef.
Buwah - - -	Fruit.	of Célebes).	
Chettek - -	Shallow.	Pasir - - - -	Sand, shoal.
Daging-Sapi-	Beef.	Pelabuan - -	Anchorage.
Dalem - - -	Deep.	Pingir laut -	Coast, scaboard.
Dammar - -	Gum.	Pisang - - -	Banana.
Darat - - -	Coast, land.	Prau - - - -	Boat.
Dessa - - -	District with vill-	Puhun - - -	Tree.
	ages.	Pulo - - - -	Island.
Doro - - - -	Mountain.	Putih - - -	White.
Gunong - - -	Mountain.	Renda - - -	Low.
Ikan - - - -	Fish.	Roti - - - -	Bread.
Itam - - - -	Black.	Rottan - - -	Rattan cane.
Jalan - - - -	Road.	Ruma - - - -	House.
Jankar - - -	Anchor.	Sampan - - -	Small boat.
Jemara-boom	Casuarina tree.	Sayuran - -	Vegetables.
Kaler - - - -	North.	Selat - - - -	Channel, strait.
Kali - - - -	River.	Seros - - - -	Fishing stakes.
Kampong - -	Village.	Tali - - - -	Cable.
Kapal - - - -	Ship.	Tanjong - -	Cape, point.
Karang - - -	Coral reef.	Tebu - - - -	Sugar cane.
Kechil - - -	Little, small.	Telok - - - -	Bay.
Kelapa - - -	Cocoanut.	Tida Angin -	Calm.
Kering - - -	Dry.	Titian - - -	Mole, jetty.
Kidul - - - -	South.	Toro - - - -	Cape, point.
Kotta - - - -	Town.	Tripang - - -	Bêche-de-mer.
Kroon-boom -	Tree, round top.	Tukoh - - -	Islet.
Kulon - - - -	West.	Tuwak - - -	Old.
Kupel-boom -	Tree, dome top.	Wetan - - -	East.

BUGIS.

Bugis.	English.	Bugis.	English.
Alau - - -	East.	Manu-manu - - -	Bird.
Angieng - - -	Wind.	Maputih - - -	White.
Api - - -	Fire.	Marakho - - -	Dry.
Ase - - -	Rice in the straw.	Mariawa - - -	Low.
Atti - - -	Ebb or low tide.	Matoa - - -	Old.
Baichu - - -	Little, small.	Menralang - - -	Deep.
Balango - - -	Anchor.	Padoma - - -	Mariner's compass.
Bale - - -	Fish.	Paduran - - -	Town.
Baru - - -	New.	Pasang - - -	Flood or high tide.
Bassi - - -	Iron.	Pong-ajie - - -	Tree.
Batowa - - -	Large, great.	Potana - - -	Coast, land.
Batu - - -	Rock, stone.	Prau-Lopi - - -	Ship.
Becho - - -	Little, small.	Raukang - - -	Rattan cane.
Bola - - -	House.	Ri-aja - - -	West.
Bulo - - -	Bamboo cane.	Roti - - -	Bread.
Bulu - - -	Mountain.	Salla - - -	Strait.
Buwa buwa - - -	Fruit.	Salo - - -	River.
Enne - - -	Shallow.	Sannang - - -	Calm sea.
Gusong - - -	Sand, shoal.	Sapi - - -	Beef.
Jiko - - -	Bay.	Solo - - -	Current.
Kaluku - - -	Cocoanut.	Solok - - -	Strait.
Kappala - - -	Ship.	Sompa - - -	Sail.
Karang - - -	Coral reef.	Tabbu - - -	Sugar cane.
Kassi - - -	Sand.	Tanah - - -	Land.
Klotto - - -	Dug-out (canoe).	Tasi - - -	Sea.
Labuwang - - -	Anchorage.	Timuna-salo or)	Mouth of a river.
Layland - - -	Road.	Timuna-winanga)	
Lemba - - -	Bay.	Tulu - - -	Cable.
Libukang - - -	Island.	Ujong - - -	Cape, point.
Lino - - -	Calm.	Ukayu - - -	Vegetables.
Lopo, or Lopo Bung-		Using - - -	Coal.
ka - - -	Mud.	Uti - - -	Banana.
Mabiring-tasi - - -	Coast, seaboard.	Uwae - - -	Water.
Malampe - - -	Long.	— tasi - - -	Salt water.
Malotong - - -	Black.	— tuwo - - -	Fresh water.
Maniyang - - -	South.	Wanuwa - - -	Town.
Manne - - -	Shallow.	Winanga - - -	River.
Manorang - - -	North.	Wrai - - -	West.

NOTE.—The Bugis words were supplied by the Secretary for Native Affairs at Makassar.

SYSTEM OF ORTHOGRAPHY

Adopted by the Admiralty for Sailing Directions and Charts.

As far as has been found possible with existing knowledge, native names are spelt in accordance with the following system, which has been adopted by the principal authorities in Great Britain, and by the United States, and has been for some years in process of gradual introduction into all Admiralty Sailing Directions and Charts.

No change is made in the orthography of foreign names in countries which use Roman Letters; thus French, Spanish, Portuguese, Dutch, &c., names will be spelt as by the respective nations.

1. Where native names have been so long written in a form which, though not in accordance with this system, has become familiar to English eyes from being so spelt in all charts and maps, they are retained.

2. The true sound of the word as locally pronounced is taken as the basis of the spelling.

3. An approximation to the sound is alone aimed at. A system which would attempt to represent the more delicate inflections of sound and accent would be so complicated as only to defeat itself.

4. The broad features of the system adopted are that vowels are pronounced as in Italian and consonants as in English, *every letter being pronounced*. Two accents only are used:—

(1.) The acute, to denote the syllable on which stress is laid. The use of this is very important, as the sounds of many names are entirely altered by the misplacement of this “stress.”

(2.) The sign ~ over the letter U to denote the short sound of that vowel under certain circumstances. (See table.)

5. When two vowels come together, each one is sounded, though the result, when spoken quickly, is sometimes scarcely to be distinguished from a single sound, as in *ai, au, ei*.

The amplification of the rules is given below.

Information is invited as to the proper spelling of native names, so as to produce the nearest approximation to the true sound, by this system.

Letters.	Pronunciation and Remarks.	Examples.
a	<i>ah</i> , a as in <i>father</i> - - - -	Java, Banána, Somáli, Bari.
e	<i>eh</i> , e as in <i>bet</i> ; <i>a</i> as in <i>fat</i> - - -	Tel-el-Kebír, Oléleh, Yezo, Levúka, Peru.
i	English <i>e</i> ; <i>i</i> as in <i>ravine</i> ; the sound of <i>ee</i> in <i>bet</i> . Thus, not <i>Feejee</i> , but	Fiji, Hindi.
o	<i>o</i> as in <i>mote</i> - - - -	Tokyo.
u	long <i>u</i> as in <i>flute</i> ; the sound of <i>oo</i> in <i>boot</i> . <i>oo</i> or <i>ou</i> should never be employed for this sound. Thus, not <i>Zooloo</i> or <i>Zoulou</i> , but	Zulu, Sumatra.

Letters.	Pronunciation and Remarks.	Examples.
	The shorter sound of the different vowels, when necessary to be indicated, can be expressed by doubling the consonant that follows. The sounds referred to are as follows :— The short <i>a</i> as in <i>fatter</i> , as compared with the long <i>a</i> as in <i>father</i> . The short <i>e</i> as in <i>better</i> , as compared with the long <i>e</i> as in <i>me</i> . The short <i>i</i> as in <i>sinner</i> , as compared with the long <i>i</i> as in <i>wine</i> . The short <i>o</i> as in <i>sobbing</i> , as compared with the long <i>o</i> as in <i>sober</i> . The short <i>u</i> as in <i>rubber</i> , as compared with the long <i>u</i> as in <i>rubric</i> .	Yarra, Tanna, Mecca, Jidda, Bonny.*
ü	is the same short sound of <i>u</i> as is denoted by doubling the consonant following, but is used, and only used, where such doubling is impossible, as in case of words where <i>u</i> is followed by two different consonants, as in <i>Tüng</i> , pronounced as the English <i>tongue</i> . Doubling of a vowel is only necessary where there is a distinct repetition of the single sound.	Nuulúa, Oosima.
ai	English <i>i</i> as in <i>ice</i> - - - -	Shanghai.
au	<i>ow</i> as in <i>how</i> . Thus, not <i>Foochow</i> , but	Fuchau.
ao	is slightly different from <i>au</i> - - - -	Macao.
aw	when followed by a consonant or at the end of a word as in <i>law</i> - - - - thus	Cawnpore.
ei	is the sound of the two Italian vowels, but is frequently slurred over, when it is scarcely to be distinguished from <i>ey</i> in the English <i>they</i> , or <i>ei</i> in <i>eight</i> .	Beirut, Beilul.
b	English <i>b</i> .	
c	is always soft, but is so nearly the sound of <i>s</i> that it should be seldom used. If <i>Celébes</i> were not already recognised it would be written <i>Selébes</i> .	Celébes.
ch	is always soft as in <i>church</i> - - - -	Chingehin.
d	English <i>d</i> .	
f	English <i>f</i> . <i>Ph</i> should not be used for the sound of <i>f</i> . Thus, not <i>Haiphong</i> , but	Haifong, Nafa.
g	is always hard. (Soft <i>g</i> is given by <i>j</i>) -	Galápagos.
h	is always pronounced when used.	
hw	as in <i>what</i> , better rendered by <i>hw</i> than <i>wh</i> , or <i>h</i> followed by a vowel. Thus, <i>Hwang ho</i> , not <i>Whang ho</i> or <i>Hoang ho</i> .	Hwang ho, Ngan hwei.
j	English <i>j</i> . <i>Dj</i> should never be put for this sound.	Japan, Jinchuen.

* The *u* is retained as a terminal in this word under Rule 1. The word is given as a familiar example of the alteration in sound caused by the second consonant.

Letters.	Pronunciation and Remarks.	Examples.
k	English <i>k</i> . It should always be put for the hard <i>c</i> . Thus, not <i>Corea</i> , but	Korea.
kh	The Oriental guttural - - - -	Khan.
gh	is another guttural, as in the Turkish -	Dagh, Ghazi.
l	} As in English.	
m		
n		
ng	has two separate sounds, the one hard as in the English word <i>finger</i> , the other as in <i>singer</i> . As these two sounds are rarely employed in the same locality, no attempt is made to distinguish between them.	
p	As in English.	
ph	As in <i>loophole</i> - - - -	Mokpho, Chemulpho.
th	stands both for its sound in <i>thing</i> , and as in <i>this</i> . The former is most common -	Bethlehem.
q	should never be employed; the sound of <i>qu</i> in <i>quiver</i> is given as <i>kw</i> . When <i>qu</i> has the sound of <i>k</i> , as in <i>quoit</i> , it should be given by <i>k</i> .	Kwangtung.
r	As in English.	
rh	As in <i>sin</i> .	
sh	} As in English.	
t		
v		
w		
x		
y	is always a consonant, as in <i>yard</i> , and therefore should never be used as a terminal, <i>i</i> or <i>e</i> being substituted. Thus, not <i>Mikindány</i> or <i>Wady</i> , but not <i>Kwaly</i> , but	Kikuyu. Mikindáni, Wadi. Kwale.
z	English <i>z</i> - - - -	Zulu.
zh	French <i>j</i> , or as <i>s</i> in <i>treasure</i> - - - - Accents should not generally be used, but where there is a very decided emphatic syllable or stress which affects the sound of the word, it should be marked by an <i>acute</i> accent.	Muzhdaha. Tongatábu, Galápagos, Paláwan, Saráwak.

In the case of native names in countries under the dominion of other European powers, in whose maps, charts, &c., the spelling is given according to the system adopted by that power, such orthography is, as a rule, disregarded, and the names are spelt according to the British system. Thus the island east of Java in possession of the Dutch is spelt *Madoera* by them, but on Admiralty charts *Madura*. A town in Java appears on Dutch charts as *Tjilatjap*; in the British, *Chilachap*.

When a foreign language is written in a vocabulary of fixed sounds, so as to permit of transliteration into the British system, a table of

equivalents for each letter is drawn up, and names of places can be transliterated without regard to pronunciation.

To reduce Greek names to the orthographic form, required by the foregoing system, would require so many changes that it has been decided to defer the revision of Admiralty publications until the system has been more generally introduced and used.

The Greek names are therefore left for the present in their old shape, but these give in most cases a very erroneous idea of the sound of the names, as pronounced by Greeks, and in many cases the modern Greek spelling gives a clue to the pronunciation by aid of the table of equivalents.

Thus Ευβοια now spelt Eubœa is pronounced Evvia.

„ Χαλκίς „ Chalcis „ Khalkis.

„ Κεφαλληνία „ Cephallonia „ Kefallinia.

Whenever C appears in a Greek name as at present written it may be taken for granted it has the sound of K.

Greek Letters	Roman Equivalents by Admiralty System	Greek Letters	Roman Equivalents by Admiralty System
Α α	a	Ρ ρ	r
Β β	v	Σ σ ς	s
Γ γ	g	Τ τ	t
Δ δ	d	Υ υ	i
Ε ε	e	Φ φ	ph
Ζ ζ	z	Χ χ	kh
Η η	i	Ψ ψ	ps
Θ θ	th	Ω ω	o
Ι ι	i	ΑΙ αι	ei
Κ κ	k	ΕΙ ει	i
Λ λ	l	ΟΙ οι	i
Μ μ	m	ΟΥ ου	u
Ν ν	n	ΥΙ υι	i
Ξ ξ	x	ΑΥ αυ	aph, av
Ο ο	o	ΕΥ ευ	eph, ev
Π π	p	ΗΥ ηυ	iph, iv

INFORMATION RELATING TO CHARTS, SAILING DIRECTIONS, AND THE GENERAL NAVIGATION OF H.M. SHIPS.

ON THE CORRECTION OF CHARTS, SAILING DIRECTIONS, AND LIGHT LISTS.

THE three descriptions of publications as guides to navigation, which are affected by the continual changes and alterations that take place, are the Charts, the Sailing Directions, and the Light Lists.

Of these the Charts should always be, so far as our knowledge permits, absolutely correct to date; the Sailing Directions, however, cannot, from their nature, be so corrected, and *in all cases where they differ from charts, the largest scale chart must be taken as the guide for navigation.*

The Light Lists are corrected annually.

1. *Charts.*—When issued to a ship on commissioning, the charts have received all necessary corrections to date. As sent from the Hydrographic Department they are correct to the date of issue as stamped on each folio. They then receive such corrections by hand in the dépôts as are required, and are so issued to the ships.

The charts in the folios should have the same number and title as shown against each in the Lists pasted on the outside of the folio. The Navigating Officer is to satisfy himself that they do so agree before signing the receipt for the charts, &c.

All small but important corrections affecting navigation that can be made by hand are notified by Notices to Mariners, and should at once be placed on the charts to which they refer, in accordance with the following uniform system:—

1. All corrections, additions to, erasures on Charts are to be neatly made in red (except as explained in paragraph 10 *d*). In every case the recognised Chart abbreviations are to be used. (*See Admiralty Chart X. 11.*)

2. The number and date of every Notice to Mariners, from which corrections, &c., as above, have been made, are to be entered in red at the lower left-hand corner of the Chart, in the following manner, viz.:—

(07) 123, 1145, 1503; (08) 232; (10) 1506, 1721; (11) 34, &c., and in no other place or form (except as explained in paragraph 10 *d*).

3. *General Remarks.*—The amount of information to be inserted on a Chart is to be in accordance with that already engraved on such Chart.

4. *The year date* is to be inserted against wrecks, reported shoals, channels dredged, depth of water on bars or in shifting channels, and irregularity of lights, but only on the largest scale chart affected.

5. *On the Coast Charts* full particulars of lights and fog signals are to be inserted where possible, omitting minor details of lights and fog signals of harbours.

6. *On Charts of smaller scale than Coast Charts* lights and fog signals of harbours are not to be inserted, and particulars of other

lights and fog signals are to be lessened as the scale of the Chart decreases, omitting details in the following order:—

For lights—(1) Height, (2) Period, (3) No. in Group, (4) Visibility, thus:—

Lt. Gp. Fl. (3), Red. ev. 20 sec. 150 ft., vis. 12 m.

(1) Lt. Gp. Fl., (3) Red. ev. 20 sec. vis. 12 m., (2) Lt. Gp. Fl.,
(3) Red. vis. 12 m.

(3) Lt. Gp. Fl. Red. vis. 12 m., (4) Lt. Gp. Fl. Red.

For fog signals, thus:—(1) Fog Siren, 2 blasts ev. min., (2) Fog Siren, (2) ev. min., (3) Fog Siren, ev. min., (4) Fog Siren.

7. *On Ocean Charts* lights visible 15 miles or over are alone to be inserted, and then only their character and colour, *e.g.*, Lt. Alt., Lt. Gp. Fl., Lt. Occ., Lt. F.R.

8. *Light-buoys*.—No period is to be inserted against a light-buoy except in large scale plans; on ordinary scales only the character, *e.g.*, Lt. Occ., Lt. Fl.

9. *On Coast Charts* inner harbour buoys and beacons are not to be inserted, and on small scale coast charts only the outer buoys.

10. *Arrangement of Writing, &c.*—Writing is to be as much as possible clear of the water, unless the objects referred to are on the water:—

- (a) When inserting corrections, care must be taken not to obliterate any of the other information already on the chart.
- (b) When "Notes" are to be inserted (such as Cautionary, Tidal, &c.), they should be written in a convenient but conspicuous place, where they will not interfere with any other details.
- (c) *Erasures* are never to be made. Where necessary, the details to be corrected are to be crossed through in red ink.
- (d) *Temporary or intended changes* are to be inserted on the chart in pencil, with the number and year of the Notices to Mariners against them, thus:—N. to M. $\frac{43}{1913}$ temp. (which is also to be repeated in pencil *below* the "small corrections" dates at the lower left-hand corner of the chart), and in the case of intended changes, the particulars finally inked in, in red, when further notice has been received that the changes have been made. In the case of temporary changes, the pencil notations are to be rubbed out when a further Notice has been received cancelling them.

Charts, when received from a Chart Dépôt or direct from the Hydrographic Department, will *not* have received the above-mentioned pencil corrections, but on first supply of a Chart Set, a copy of the latest Notice to Mariners, containing a List of all Notices to Mariners of a Temporary character and Preliminary Notices which are still in force *by which any Charts are temporarily affected*, will be specially handed to the Navigating Officer or attached to Chart Set, and the first duty of the Navigating Officer will be to make the necessary corrections in pencil to the charts affected.

11. One copy of all Notices to Mariners is to be pasted into the Sailing Directions, in its appropriate place, so that if fuller detail is required than what the scale of the chart permits to be given, it will be found on the proper page referring to the given locality or subject.

12. Unmounted Sets of Charts supplied for the personal use of the Admiral, Folio Atlases supplied for information of Officers and Junior Officers, and Charts for Ships' Company, are stamped, "Not to be used for Navigation," and need not, therefore, be kept corrected.

2. *The Sailing Directions* are not corrected before issue, but on page iii. in the "Advertisement" to each volume will be found the number of the last Notice to Mariners used in its revision, the numbers of the subsequent Notices affecting it between going to press and issue to H.M. Ships are given in the Notice to Mariners announcing its publication.

Supplements and Revised Supplements referring to each volume are published from time to time. Supplements contain all the information received up to date since the publication of the volume to which they refer, and a Revised Supplement cancels the previous Supplements.

The existence of a Supplement is to be noted in the tabular form placed for the purpose inside the cover of each volume, and also on receipt of a further Revised Supplement after commission. Two copies are issued to each ship, one of which is to be retained intact, for reference, notations referring to it being made on the pages of the *Sailing Directions* affected; the other copy may be cut up, if considered desirable, the slips being pasted in the volume at the appropriate place.

In the advertisement to each Supplement will be found the number of the last Notice to Mariners used in its compilation.

In January of each year, a summary of the information affecting each volume of *Sailing Directions*, which has been published during the preceding year in Notices to Mariners, is issued in a separate publication. If a Supplement or Revised Supplement has been issued during the year, this summary will only include Notices to Mariners issued since the date of such Supplement; if one is in preparation at the end of the year, no summary will be issued.

An early duty of the Navigating Officer after drawing a chart set is to correct the *Sailing Directions* from the Supplements or Revised Supplements, Annual Summaries of Notices to Mariners and Notices to Mariners supplied with the chart set.

As Notices to Mariners prior to the date of issue of a chart set from the Hydrographic Department are not supplied with the set, he should demand from that Department such Notices to Mariners as are required to complete the interval between the last published Supplement, Revised Supplement, or Summary of Notices to Mariners, and the first number of the Notices to Mariners drawn with the chart set.

One copy of each Notice to Mariners should be pasted into the *Sailing Directions* in its appropriate place as soon as received.

It must, however, be thoroughly understood that *Sailing Directions* will never be correct in all minor details, except up to the date of the last Supplement or Revised Supplement, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide; for which purpose, for ordinary navigation, they are sufficient.

3. *The Light Lists*, annually published at the beginning of each year, are not corrected in the depôts before issue, but appendices are issued every week with the weekly copies of Notices to Mariners, giving the alterations that have taken place.

It is the duty of the navigating officer when he receives the set of charts to make notations in the Light Lists from these appendices, and from Notices to Mariners of later date; and to keep them so corrected from time to time.

The Light Lists should always be consulted as to the details of a light, as the description in the Sailing Directions does not embrace the sectors, and the other information on the lights may be obsolete, in consequence of changes made since publication. A red label to this effect is inserted opposite page 1 of all Sailing Directions. The charts also may not be equally up-to-date in some details, for which no Notices to Mariners have been issued.

THE USE OF CHARTS AS NAVIGATIONAL AIDS AND GENERAL REMARKS RELATING TO PRACTICAL NAVIGATION.

1. *Reliance on a Chart.*—The value of a chart must manifestly depend upon the accuracy of the survey on which it is based, and this becomes more important the larger is the scale of the chart.

To estimate this, the date of the survey, which is always given in the title, is a good guide. Besides the changes that, in waters where sand or mud prevails, may have taken place since the date of the survey, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail, and, until a plan founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbours and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fullness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

It appears to be insufficiently realised that the degree of reliance which may reasonably be placed upon an Admiralty chart, even in surveys of modern date, is mainly dependent on the scale on which the survey was made. The scale for publication is now generally that of the original survey, except in the case of Coast sheets, which are sometimes reduced. It should not, therefore, be assumed that the original survey was made on a larger scale than that published.

It must be borne in mind that the only method of ascertaining the inequality of the bottom of the sea is by the laborious process of sounding, and that in sounding over any area, the boat or vessel obtaining the soundings is kept on given lines; that each time the lead descends it only ascertains the depth of water over an area equal to the diameter of the lead, that is about two inches, and that consequently each line of soundings, though miles in length, is only to be considered as representing a width of two inches.

Surveys are not made on uniform scales, but each survey is made on a scale commensurate with its apparent importance. For instance, a general survey of a coast which vessels only pass in proceeding from one place to another is not usually made on a scale larger than one inch to the nautical mile, while surveys of areas where vessels are likely to anchor, are made on a scale of three inches to the mile, and surveys of frequented ports, or harbours likely to be used by Fleets, on a scale of from six inches to ten inches to the nautical mile.

Close examination by sounding is the only method by which surveys on a large scale can be made, and in view of the vast mileage of surveys yet requiring completion in the interests of navigation, it would be a waste of time to undertake large scale Coast surveys.

The scale on which a survey is to be conducted having been settled, it is manifestly superfluous to obtain more lines of soundings than can be represented on the paper. 100 soundings, which is the maximum number that can be placed with clearness on every square inch of paper, means that on a scale of one inch to the mile each sounding on the chart occupies an area representing eight acres of actual ground, whilst on a scale of six inches to the mile each sounding represents an area of a little less than a quarter of an acre, i.e., of 100 feet square.

The following diagram represents as many soundings as can be placed legibly on a square inch of paper:—

16	15	15	13	13	14	12	11	10	9
14	15	14	14	13	13	12	11	9	8
15	15	14	17	16	14	13	10	10	9
16	16	17	18	16	12	11	8½	9	10
18	17	15	12	9	7½	7½	7½	9	10
19	16	12	9	5½	4½	5½	6½	8½	9
22	19	16	10	5½	5½	6½	7½	8½	10
20	16	12	7½	5½	6½	6½	7½	8½	10
18	15	11	9	7½	7	7½	8½	10	11
20	17	14	11	12	10	9	10	11	13

Little assistance in detecting excrescences on the bottom is afforded by the eye, when sounding in a boat, even in clear weather, on account of the observer being within five feet of the surface; none in turbid seas. If, therefore, there is no inequality in the soundings to cause suspicion, a shoal patch between two lines may occasionally escape detection.

Lines of soundings plotted as close as may be practicable on a scale of 6 inches to the mile would be 100 feet apart, and each line would be only 2 inches in actual width.

Thus, in a chart on a scale of 1 inch to the mile, an inequality of some acres in extent rising close to the surface, if it happened to be situated between two lines, might escape the lead; whilst in a chart on a scale of 6 inches, inequalities as large as battle-ships, if lying parallel to, and between the lines of soundings, might exist without detection if they rose abruptly from an otherwise even bottom.

General Coast charts should not, therefore, be looked upon as infallible, and a rocky shore should on no account be approached within the contour line of 10 fathoms, without taking every precaution to avoid a possible danger; and even with surveys of harbours on a scale of 6 inches to the mile, vessels should avoid, if possible, passing over charted inequalities in the ground, as some isolated rocks are so sharp that the lead will not rest on them.

Blank spaces among soundings mean that no soundings have been obtained in these spots. When the surrounding soundings are deep it may with fairness be assumed that in the blanks the water is also deep; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch.

A wide berth should therefore be given to every rocky shore or patch, and this rule should be invariably followed, viz., that instead of considering a coast to be clear, unless it is shown to be foul, the contrary should be assumed.

2. Fathom Lines a Caution.—Except in plans of harbours that have been surveyed in detail, the five-fathom line on most Admiralty charts is to be considered as a caution or danger line against unnecessarily approaching the shore or bank within that line, on account of the possibility of the existence of undiscovered inequalities of the bottom, which nothing but an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for such a detailed survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

The ten-fathom line is, on rocky shores, as before mentioned, another warning, especially for ships of heavy draught.

Charts where no fathom lines are marked must be especially regarded with caution, as it generally means that soundings were too scanty and the bottom too uneven to enable them to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed round, as there is no knowing how closely the spot may have been examined.

3. Chart on largest scale always to be used.—It sometimes happens that, from press of work, only the copper plate of the larger scale chart of a particular locality can at once receive any extensive re-arrangement of coastline or soundings. This is an additional reason, besides the obvious one of the greater detail shown, why this largest scale chart should always be used for navigating.

4. Caution in using Small Scale Charts.—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. This is particularly to be observed when coming to an anchor on a narrow ledge of convenient depth at some distance from the shore.

For the same reason bearings to objects near should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

5. Graduation.—All Plans are now being graduated in skeleton style before publication in order to facilitate easy reference to Astronomical positions; previously published plans are also graduated as opportunity offers. The graduation is, however, of necessity, often based upon imperfect information of a conflicting nature; for this reason, whenever an Astronomical position is quoted other than approximate (i.e., when seconds are given), it is necessary to quote also the number of the particular chart from which the position has been derived.

6. Distortion of Printed Charts.—The paper on which charts are printed has to be damped. On drying, distortion takes place from the inequalities in the paper, which greatly varies with different paper and the amount of the original damping; but it does not affect

navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree, when carefully plotted upon the chart, especially if the lines are to objects at some distance. The larger the chart the greater the amount of this distortion.

7. Buoys.—It is manifestly impossible that any reliance can be placed on buoys always maintaining their exact position. Buoys should therefore be regarded as warnings and not as infallible navigating marks, especially when in exposed positions; and a ship should always, when possible, be navigated by bearings or angles of fixed objects on shore and not by buoys.

Gas Buoys.—The lights shown by gas buoys cannot be implicitly relied on, as, if occulting or flashing, the apparatus may get out of order, or the light may be altogether extinguished. These lights in the British islands are from 5 to 217 candle power.

8. Lights.—Circles drawn on charts round a light are not intended to give information as to the distance at which it can be seen, but solely indicate, in the case of lights which do not show the same characteristics or colours in all directions, the bearings between which the differences occur.

All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of an observer's eye of 15 feet. The table of distances visible due to height, at the end of each Light List affords a means of ascertaining how much more or less the light is visible should the height of the bridge be more or less. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light at night, the fact is often forgotten that from aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be afterwards obtained from the standard compass.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by remarking its order, or candle power, as given in the Light Lists, and in some cases by noting how much its visibility in clear weather falls short of the range due to the height at which it is placed. Thus, a light standing 200 feet above the sea, and only recorded as visible at 10 miles in clear weather, is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles, if of any power. (*See table in Light List before mentioned.*)

The distance from a light cannot be estimated either by its brilliancy or its dimness.

On first making a light from the bridge, by at once lowering the eye several feet and noting whether the light is made to dip, it may be determined whether the vessel is in the circle of visibility corresponding with the usual height of the eye or unexpectedly nearer the light.

9. Fog Signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from wind, large areas of silence have been found in different directions and at different distances from the fog signal station, in some instances even when in close proximity to it. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly towards the land, and is not observed by the people at a station until it is upon them; whereas a ship may have been for many hours in it, and approaching the land. In such a case no signal may be made. When sound has to travel against the wind, it may be thrown upwards; in such a case, a man aloft might hear it when it is inaudible on deck. Under certain conditions of the atmosphere, when a fog signal is a combination of high and low notes, one of the notes may be inaudible.

The mariner should not assume—

- a. That, because he fails to hear the sound, he is out of hearing distance.
- b. That, because he hears a fog signal faintly, he is at a great distance from it.
- c. That, because he hears the sound plainly, he is near it.
- d. That, because he does not hear it, even when in close proximity, the fog signal has ceased sounding.
- e. That the distance from and the intensity of the sound on any one occasion, are a guide to him for any future occasion.

Taken together, these facts should induce the utmost caution in closing the land in fogs. The lead is generally the only safe guide.

10. Tides and Tidal Streams.—In navigating coasts where the tidal range is considerable, caution is always necessary. It should be remembered that there are indraughts to all bays and bights, although the general run of the stream may be parallel to the shore.

The turn of the tidal stream off-shore is seldom coincident with the time of high and low water on the shore. In open channels, the tidal stream ordinarily overruns the turn of the vertical movement of the tide by about three hours, forming what is usually known as tide and half-tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

In crossing a bar or shallow flats, "Table B, for finding the height of tide at any intermediate hour between high and low water," and diagrams, given in the Tide Tables, will be found of great assistance in calculating how much the water has risen or fallen at any hour of the tide.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can never be depended upon, and additional caution is necessary.

It should also be remembered that at times the tide falls below the level of low-water ordinary springs. This always occurs on the coasts of Europe at the equinoxes, but in other parts of the world and especially in the tropics, such periodic low tides may coincide more frequently with the solstices. Wind or a high barometer may produce it at any time, and the amount varies with locality. When the moon's perigee coincides with the full or new moon the same effect is often produced.

11. Arrows on charts only show the most usual or the mean direction of a tidal stream or current. It must never be assumed that the

direction of a stream will not vary from that indicated by the arrow. In the same manner, the rate of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

12. Fixing position.—The most accurate method of fixing a position relative to the shore is by angles between well-defined objects on the chart. All ships are supplied with a station-pointer, and this method should be used whenever possible.

Two things are, however, necessary to its successful employment: First, that the objects be well chosen; and, second, that the observer is skilful and rapid in his use of the sextant and station-pointer.

For the former, reference can be made to the pamphlet on the use of the station-pointer, which is in every chart box; the latter is only to be obtained by practice.

It will readily be seen that in war time, when the compass may be knocked away, or gun-fire may make it undesirable to expose the person more than necessary, a sextant offers great advantages, as angles can be obtained from any position whence the objects are visible. It is this contingency that makes it especially desirable that all navigating officers should become expert in this method of fixing a ship's position.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbours or narrow passages among mud banks, navigation by sextant and station-pointer is invaluable, as a true position can only be obtained by its means. A small error in either taking or plotting a bearing under such circumstances may put the ship ashore.

It is not intended that the use of the compass to fix the ship should be given up; there are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed. In all cases where great accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal, or of additions to a chart of fresh soundings or new buildings. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. In the case of ordinary soundings, it is only necessary to take a third angle now and then; firstly, to check the general accuracy of the chart, as above stated; secondly, to make certain that the more important soundings, as at the end of a line, are correctly placed.

Sometimes, when only two objects are visible, a compass bearing and sextant angle may be used with advantage.

In passing near a point of land, or an island, the method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "four-point bearing," when the bearing is taken four points on the bow and on the beam, the distance from the object at the latter position being the distance run between the times of taking the two bearings, allowing for current, gives an excellent fix for a departure but does not ensure safety, as the point and probably the rocks off it are abeam before the position is obtained.

By taking the bearings of two points and four points on the bow, a very good position is obtained before the object is passed; the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current.

This is, however, only strictly true if the current is directly with or against the course of the ship. If a cross current has to be allowed for, the results by this method may be altogether erroneous and misleading. The following example shows in a tabular form the errors that might be produced by accepting the distance run in the interval, allowing for current, as the distance of the object at time of second bearing.

Example: A vessel steering East sights a light bearing E.N.E., or two points on the bow; one hour after, having run in the interval 10 miles by log, the light bears N.E., *i.e.*, she has doubled the angle on the bow. Current, in all cases, at the rate of 2 miles an hour.

Direction of Current	Distance run between 1st & 2nd Bearings		Distance of Light at 2nd Bearing	Direction of Current	Distance run between 1st & 2nd Bearings		Distance of Light at 2nd Bearing
	By Log	Allowing for Current			By Log	Allowing for Current	
	Miles	Miles	Miles		Miles	Miles	Miles
East -	10	12	12	West -	10	8	8
E.N.E. -	10	11.8	10	W.S.W. -	10	8.2	10.2
N.E. -	10	11.4	8	S.W. -	10	8.7	11.9
N.N.E. -	10	11	6.2	S.S.W. -	10	9.4	13.6
North -	10	10.2	5.3	South -	10	10.2	14.7
N.N.W. -	10	9.4	4.9	S.S.E. -	10	11	15
N.W. -	10	8.7	5.3	S.E. -	10	11.4	14.7
W.N.W. -	10	8.2	6.1	E.S.E. -	10	11.8	13.8

The following rule should be observed in all cases of a cross current, *viz.* :—

When the angle between the second bearing and the course made good (over the ground) is double the angle between the first bearing and the course made good (over the ground) the distance from the object is equal to the distance made good (over the ground) between the times of the first and second bearings.

To get a reliable result the difference between the first bearing and the course made good (over the ground) should never be less than 20°. It follows, therefore, that it is necessary, before observing the first bearing, to decide upon the course being made good (over the ground). This may be done as follows, *viz.* :—

From any point, A, on the chart draw a line A B, representing by its direction the course steered and by its length the speed through the water. From the point B, draw another line, B C, representing in a similar manner the estimated direction and rate of the current, &c., to be allowed for. Then a line joining the points A and C will represent in the same manner the course and speed which are being made good (over the ground).

A table of factors, by which to multiply the distance run, to obtain the distance of the object when any number of degrees between the two bearings has been observed, is supplied with all chart sets.

The use of a danger angle in passing outlying rocks with land behind should also not be forgotten. In employing this method, however, caution is necessary, as should the chart be not accurate, *i.e.*, should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect

In fixing by the compass, it must always be remembered that two bearings only are liable to error. An absolute error may be made in either bearing observed; errors may be made in applying the deviation; or errors may creep in in laying them on to the chart. For these reasons, a third or check bearing of some other object should be taken, especially when near the shore or dangers. The coincidence of these three lines will prevent any mistakes.

Amongst astronomical methods of fixing a ship's position, attention is drawn to the great utility of Sumner's method. A Sumner line, that is, a line drawn through the position (obtained by an assumed latitude or longitude) at right angles to the bearing of the sun, as obtained from the azimuth tables, gives at times invaluable information, as the ship must be somewhere on that line, provided the chronometer is correct. A deep cast of the lead at the same time may often serve to give an approximate position on the line. An early and very accurate position can also be obtained by Sumner's method, by getting a Sumner line by a bright star at daylight when the horizon is well visible, and another Sumner line by the sun when a few degrees above the horizon, or, better still, by observing two or more stars at twilight. The Sumner lines thus obtained will, if the bearing of sun and star differ three points or more, give an excellent result.

13. Change of Variation of the Compass.—The gradual change in the variation must not be forgotten in laying down positions by bearing on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long the displacement of position from neglect of this change may be of importance. The compasses are re-engraved when the error amounts to a quarter of a point, but the chart plates cannot be corrected more frequently from the impossibility of making alterations often on one spot in a copper plate.

The geographical change in the variation is in some parts of the world sufficiently rapid to need consideration. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles, and in the English Channel about 5° in 400 miles. The Variation Chart should be consulted on this head.

On certain general charts embracing large areas with considerable change of variation, true compasses are placed instead of magnetic compasses, the variation being shown by *isogonic lines* (curves of equal magnetic variation), in a similar manner to the Variation Chart. One or two *isogonic lines* are also sometimes placed on charts, in addition to the magnetic compasses, in order to indicate the general direction of these curves, and thus facilitate the determination of the variation to be employed in portions of the chart not in immediate proximity to any one of the engraved compasses.

14. Local Magnetic Disturbance of the Compass on board Ship.—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the ship in which it is placed. Observation shows that such disturbance of the compass in a ship afloat is experienced only in a few places on the globe.

Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such rapid proportion as the distance from it increases that it would require a local centre of magnetic force

of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow, and the force strong, the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centres near together.

It is very desirable that whenever a ship passes over an area of local magnetic disturbance, the position should be fixed, and the facts reported as far as they can be ascertained.

15. Use of Oil for Modifying the Effect of Breaking Waves.—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skilfully applied, may prevent much damage both to ships (especially the smaller classes) and to boats, by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows:—

1. On free waves, *i.e.*, waves in deep water, the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.

3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when nothing else is obtainable; but all animal and vegetable oils, such as waste oil from the engines, have great effect.

4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

5. It is useful in a ship or boat, both when running, or lying to, or in wearing.

6. No experiences are related of its use when hoisting a boat up in a sea-way at sea, but it is highly probable that much time and injury to the boat would be saved by its application on such occasions.

At anchor, when the sea is sufficient to render it difficult to hoist up or in boats, oil bags from forward or from the swinging booms have been found to render the sea alongside comparatively smooth.

7. In cold water, the oil, being thickened by the lower temperature, and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

8. The best method of application in a ship at sea appears to be: hanging over the side, in such a manner as to be in the water, small canvas bags, capable of holding from one to two gallons of oil, such bags being pricked with a sail needle to facilitate leakage of the oil.

The position of these bags should vary with the circumstances. Running before the wind they should be hung on either bow—*e.g.*, from the cathead—and allowed to tow in the water.

With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

Lying to, the weather bow and another position farther aft seem the best places from which to hang the bags, with a sufficient length of line to permit them to draw to windward, while the ship drifts.

9. Crossing a bar with a flood tide, oil poured overboard and allowed to float in ahead of the boat which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances the effect cannot be so much trusted.

On a bar with the ebb tide it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current, and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil is diffused well ahead of the boat, and the bag can be readily hauled on board for refilling if necessary.

12. Towing a vessel in a heavy sea, oil is of the greatest service, and may prevent parting the hawser. Distribute from the towing vessel forward and on both sides; if used only aft the tow alone gets the benefit.

16. *Concise Rules for Revolving Storms:*—

1. Revolving storms are so named because the wind in these storms revolves round an area of low pressure situated in the centre. They have also local names, and are termed hurricanes in the West Indies and South Pacific Ocean; cyclones in the Indian Ocean, Bay of Bengal, and Arabian Sea; and typhoons in the China Sea.

2. In these storms the wind always revolves the same way in the same part of the world, that is, against the movement of the hands of a watch in the northern hemisphere, and with the hands of a watch in the southern hemisphere. The wind does not revolve in circles, but has a spiral movement, inwards, towards the centre.

3. Revolving storms have also, as a general rule, a progressive movement. Within the tropics they usually move from east to west at first, and then curve towards the pole of the hemisphere in which the storm is generated, and afterwards move from west to east.

4. The track which the centre of the storm takes is called the path of the storm, and the portion of the storm-field on the right of the path is known as the right-hand semicircle, and that on the left as the left-hand semicircle of the storm.

5. In the right-hand semicircle, if the observer be stationary, the wind will always shift to the right, and in the left-hand semicircle to the left. This law holds good in both hemispheres.

6. If a vessel be so situated in a storm that running before the wind the path of the advancing storm will be crossed, this is considered to be the dangerous semicircle. This will always be the right-hand semicircle in the northern hemisphere, and the left-hand in the southern.

7. These storms are most frequent in the northern hemisphere from July to November, and in the southern hemisphere from December to May. In the Bay of Bengal and Arabian Sea they, however, occur most frequently about the time of the change of the monsoon.

8. The area over which revolving storms have been known to extend varies in diameter from 20 miles to some hundreds of miles, and their rate of movement in the West Indies averages about 300 miles a day; in the China Sea, Bay of Bengal, and Arabian Sea about 200 miles a day; and in the Indian Ocean from 0 to 200 miles a day, the more stationary storms occurring at the beginning and end of the hurricane season.

9. The indications of the approach of a revolving storm are (1) an unsteady barometer, or even a cessation in the diurnal range, which is constant in settled weather; (2) a heavy swell not caused by the wind then blowing; (3) an ugly, threatening appearance of the sky.

10. In order to judge what is the best way to act if there is reason to believe a storm is approaching, the seaman requires to know (a) in which direction the centre of the storm is situated, (b) in which semicircle the ship is situated.

11. As these points cannot be determined if a vessel is moving with any speed through the water, the first proceeding should be to "stop" or "heave to," and, as it is always best to assume, at first, that the vessel may be in the dangerous semicircle, she should be hove to on the starboard tack in the northern hemisphere, and on the port tack in the southern.

12. If an observer faces the wind the centre of the storm will be from 12 to 8 points on his right hand in the northern hemisphere, and on his left hand in the southern hemisphere; 12 points when the storm begins; about 10 points when the barometer has fallen three-tenths of an inch, and about 8 points when it has fallen six-tenths of an inch or upwards.

13. If the wind shifts to the right the vessel is in the right-hand semicircle, if to the left in the left-hand semicircle, and, if the wind is steady in direction, but increasing in force, she is in the direct path of the storm.

14. If the seaman has reason to think that his vessel is in the direct path of the storm he should run with the wind on the starboard quarter in the northern, and on the port quarter in the southern, hemisphere until the barometer has ceased falling. If she is in the right-hand semicircle in the northern hemisphere she should remain hove to on the starboard tack, but if in the southern hemisphere run with the wind on the port quarter; if she is in the left-hand semicircle in the northern hemisphere she should run with the wind on the starboard quarter, but if in the southern hemisphere remain hove to on the port tack.

15. Should a vessel not have sufficient room to run when in the least dangerous semicircle, she should heave to on the port tack in the northern, and on the starboard tack in the southern, hemisphere.

16. If in a harbour or at anchor the seaman should be just as careful in watching the shifting of the wind and ascertaining the direction of the centre, as by so doing he will be able to tell on which side of the path of the storm he is situated, and be able to act according to circumstances.

17. Should the centre of a storm pass over a vessel, the wind, after blowing furiously in one direction, ceases for a time, and then blows with equal fury from the opposite direction. This makes a confused pyramidal sea, which is especially dangerous.

IN THIS WORK THE BEARINGS ARE ALL TRUE, IN DEGREES, FROM 0° (NORTH) CLOCKWISE TO 360°.

THE LATITUDES AND LONGITUDES GIVEN IN THE TEXT ARE APPROXIMATE.

THE VARIATION GIVEN IN THE SEVERAL PAGES IS FOR THE YEAR 1914.

THE BEARINGS OF LIGHTS ARE GIVEN FROM SEAWARD.

THE DISTANCES ARE EXPRESSED IN SEA MILES OF 60 TO A DEGREE OF LATITUDE.

A CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO 100 FATHOMS, OR THE TENTH PART OF A MILE.

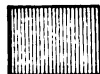
THE SOUNDINGS ARE REDUCED TO LOW WATER OF ORDINARY SPRING TIDES.

HEIGHTS ON THE LAND ARE GIVEN ABOVE HIGH WATER OF ORDINARY SPRING TIDES.

THE COLOURS OF FLAGS, BEACONS, &c., ARE SHOWN IN ACCORDANCE WITH THE FOLLOWING:—



Yellow.



Red.



Blue.



Green.



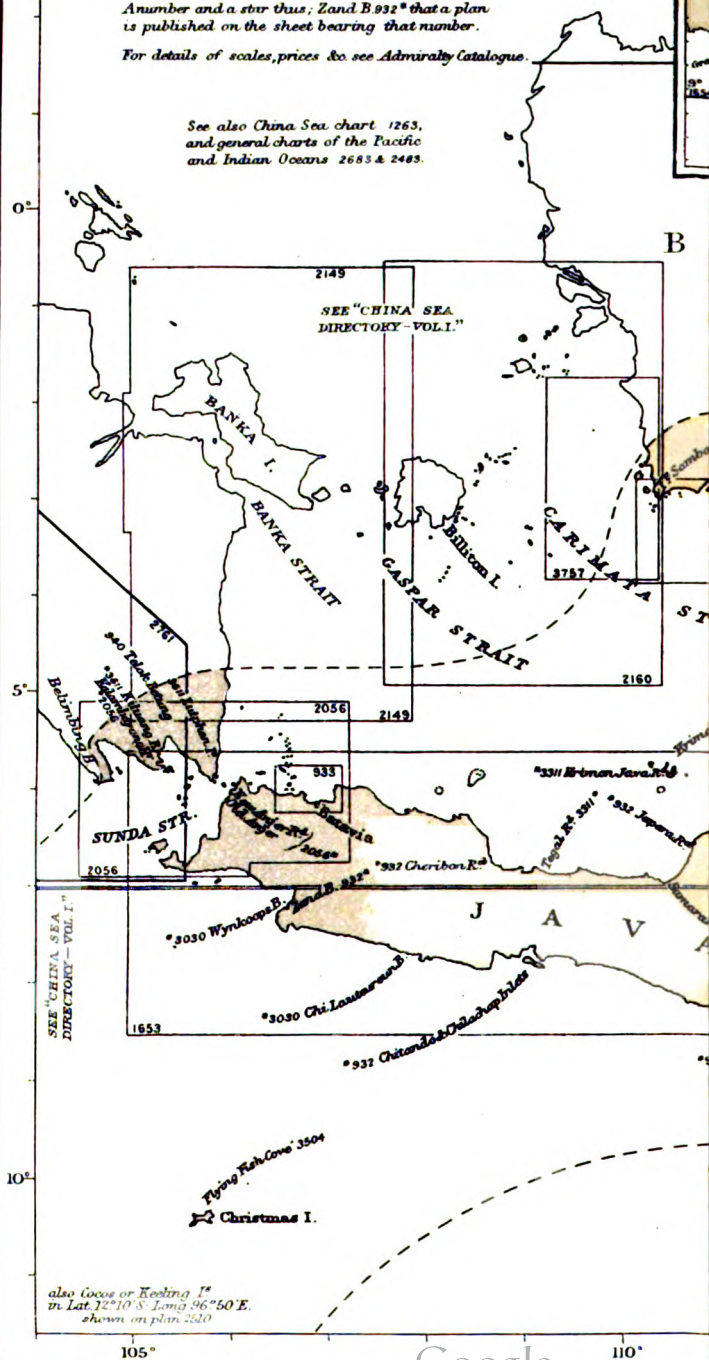
Black.

A number against a place thus; Batavia R^ds 933 indicates a separate plan of the place is published bearing that number.

A number and a star thus; Z and B.932* that a plan is published on the sheet bearing that number.

For details of scales, prices &c. see Admiralty Catalogue.

See also China Sea chart 1263,
and general charts of the Pacific
and Indian Oceans 2683 & 2483.



For details of sectors and the latest information respecting the Lights which are included in this work, seamen should consult the Admiralty List of Lights, Part VI. This List is published early in every year, corrected to the preceding 31st December.

For details of events and the Japanese intervention
concerning the rights which are held in the
East, attention is directed to the following list of
events, Part V, and the report of the
committee in the preceding list of events.

EASTERN ARCHIPELAGO PILOT,

PART II.

WESTERN PART.

CHAPTER I.

GENERAL REMARKS—WINDS AND WEATHER—CURRENTS AND
TIDES—COMMUNICATION—BUOYAGE—PASSAGES.

GENERAL REMARKS.—This work contains a description of Cocos or Keeling islands, and Christmas island; the western portion of the Eastern Archipelago, namely, Java and the islands eastward, as far as and including Timor; also Java and Flores seas; the south and east coasts of Borneo; Makassar strait, and Celebes island.

The western limit commences with Sunda strait, where it overlaps China Sea Directory, Vol. I. (Vols. I. and II., new series), repeating the description given in that work of Sunda strait and approaches, with the south-east coast of Sumatra to Banka strait. The eastern limit ends with the east coast of Celebes, the Sula islands, and Timor with its adjacent islands; here it touches Eastern Archipelago Pilot, Part III., and Australia Directory, Vol. III. The navigator should refer to the latest published work for these localities.

Many parts of the area herein dealt with have been but partially explored, and much of the information is still from reports of early navigators. Reliable soundings are also greatly needed, and the sparseness and irregular character of the depths given on charts, with the existence of so many reefs, ascertained and reported, show that further dangers may be looked for, and points to the need of extreme care and vigilance. Several surveying vessels of the Netherlands Royal Navy are employed in the archipelago, and late charts published by the government can be obtained at Anjer, in Sunda strait, or at Batavia.

Cocos or Keeling islands are two groups of low coral islands, of the atoll type, 15 miles apart, and nearly 600 miles south-west of Sunda strait. The southern, and larger group, is inhabited; copra

General charts 2510, 748b, 941a, 941b, 942a, 1263.

is the sole export; fruit, poultry, and turtle can be obtained. The islands are connected by telegraph with the island of Mauritius, and with Fremantle in Australia. They are a dependency of the Straits Settlements.

Christmas island (*Lat. 10° 29' S., Long. 105° 38' E.*), 220 miles southward of Sunda strait, 13 miles across, and nearly 1,200 feet high, is the summit of a volcanic submarine peak, surrounded by depths of 2,000 to 3,000 fathoms. The island is composed of limestone, and is thickly wooded, with large deposits of phosphate of lime. The inhabitants, about 700 in number, are all in the employ of the phosphate company. It is a dependency of the Straits Settlements.

JAVA.—Chief of the Dutch possessions in the east is the island of Java, situated on the southern margin of the great Asiatic submarine plateau. It is separated from Sumatra on the west by Sunda strait, 13 miles across at the narrowest part, and from Bali on the east by Bali strait, only 2 miles wide. In form it is long and narrow, lying in a nearly east and west direction. Its extreme length is 570 miles, while its breadth varies from 48 to 114 miles. The north coast is somewhat low, and comparatively sheltered, presenting many bays, but none of them penetrate deeply, so that there is only one good harbour, that of Surabaya, which is formed by the strait separating the main island and Madura. The southern coast is bold and precipitous, less indented than the north coast, and is exposed to a heavy and dangerous surf which rolls in upon the shore at all seasons. It is therefore little frequented, having no safe harbours but those of Chilachap, and Segoro Wedi bay.

The geological formation of Java is eminently volcanic, presenting perhaps the most material portion of that great volcanic band, which, beginning in Sumatra near the equator, extends through 30° of longitude to the Banda islands, and then, taking a north-westerly direction, embraces most of the Philippines up to the 20th degree of north latitude. A range of mountains traverses the entire length of Java through the centre; the whole of it is volcanic, the peaks varying in height from 3,000 to 12,000 feet above the sea; 9 of these exceed 10,000 feet, and 40 are in a state of more or less activity. Earthquakes are frequent, and there are many warm mineral springs.

The rivers of Java, especially on its northern side, are very numerous, but from the form of the island they are comparatively small, none navigable for vessels of burden, and few even for boats beyond the reach of the tide; the mouths of these rivers are all more or less obstructed by mud or sand bars. The largest and most useful river is the Solo, so called from its passing the native capital Solo or Surakarta; its source is in one of the low ranges of hills towards the southern side of the island, and after a tortuous course of 350 miles

General charts 748b, 941a, 941b.

empties into the sea at the entrance of Surabaya strait. When swollen by heavy rains, the river, in some parts, will rise 30 feet above the normal level.

The climate of Java is hot and uniform, as might be expected from its geographical position, but the elevated plains and plateaux, rising 1,000 to 5,000 feet above the sea, afford a variety of climates. The wet season is from October to March, when the north-west monsoon blows, and the dry season from April to September, during the prevalence of the south-east winds. The period of change of the monsoons is often unsettled and tempestuous, with violent thunderstorms. Land and sea breezes are experienced within 15 miles of the northern and southern coasts, while in some parts of the eastern and narrowest extremity, the south-east monsoon blows with great force across the entire island.

The native inhabitants of Java are all of Malay race, but are divided into three nations, speaking distinct but allied languages. These are the Sundanese, of western Java; the true Javanese, of central and eastern Java; and the Madurese, of the island of Madura and the adjacent parts of the larger island. Physically, however, they are all nearly alike, and are hardly distinguishable from the Malays of the other great islands and of the peninsula of Malacca, except that they are somewhat taller and better made.

In 1905, the population of Java and Madura was estimated at 30,098,008, of which 64,917 were Europeans; British subjects numbered 312.

Trade.—The chief productions of Java are rice, coffee, sugar, and tin; but the island also supplies many other valuable articles, as indigo, cinnamon, maize, cotton, tobacco, teak, and cinchona. The crop of sugar in 1908 was nearly 1,217,390 tons.

The high roads connecting all the chief towns of Java with the capital are excellent, and are supplied with regular posts, so that by making arrangements beforehand a traveller may have relays of horses to carry him day and night at the rate of ten miles an hour.

Standard time.—Mean time of the meridian of $109^{\circ} 48' 37.5''$ E. longitude, or 7h. 19m. 14.5s. fast on Greenwich mean time, has been adopted as standard (Central Java) time in Java.

The Lesser Sunda islands.—From the east end of Java a chain of islands stretches in a straight line for about 800 miles, till it encounters the large island of Timor which lies somewhat obliquely to the direction of the line, which is then continued for about 400 miles farther in the two chains of the Serwatti islands. These, starting from the eastern end of Timor, gradually open out, the northern chain trending to the north-eastward in a series of small islands, the southern continuing to the eastward, and terminating in the Tenimber or Timor Laut islands. A volcanic belt, with many

General charts 941a, 941b, 942a.

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General charts 748b, 941a, 941b.

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General charts 941a, 941b, 942a.

active volcanoes, runs in a direct line from Java to the east end of Timor, and then bends north and east to Banda without reaching Timor Laut, which island, with the western half of Timor, and Sumba island, appears to be non-volcanic.

The entire group presents a very different aspect from most other parts of the Malay archipelago, and especially from the Moluccas, being deficient in verdure, for the most part without forests, and often absolutely barren. This deficiency of forest-covering begins even in Bali, so close to luxuriant Java; and increases as we go eastward, till on the great island of Timor, forests such as are found in Borneo and the Moluccas are quite unknown, being only represented by dense thickets of thorny shrubs, occasionally eucalyptus, acacia, and sandalwood trees, and patches of more luxuriant woods in some of the moister ravines. The country in fact resembles Australia much more than the Moluccas.

This chain of Timoree islands is somewhat sharply divided between the two great races of the archipelago—the Malay and Papuan; the former extending as far as Sumbawa, while from Flores, through all the other islands, the latter race prevails.

BORNEO.—This island, the largest in the world, if the continent of Australia be excepted, occupies a central position in the Eastern archipelago, being, roughly speaking, equi-distant from the Philippines on the north-east, from Celebes on the east, from Java on the south, and from Sumatra and the Malay peninsula on the west. The greatest length of the island from Tanjong Sambar in the south-west to Tanjong Unsang in the north-east is about 730 miles; the maximum breadth is 600 miles. It is pear-shaped and much contracted towards the north, where the average breadth for more than 300 miles does not exceed 200 miles.

Although lying in the centre of the great volcanic belt of islands which constitute the Eastern archipelago, Borneo differs wholly from them in not possessing a single active volcano, so far as is known. Its mountains consist of many short and irregular ranges, radiating from one central chain traversing the island from south-south-west to north-north-east, and which for a considerable part of its length forms the boundary between the Dutch and Sarawak portions. The average height of this central range does not exceed 3,000 feet, but there are peaks of 5,000 and 6,000 feet, and towards the north-west extremity the lofty mountain Kini-Balu rises to a height of 13,700 feet.

The coast of Borneo is very slightly indented with bays, and nowhere by deep inlets, and it has only a small number of navigable rivers. The few bays it possesses are towards the north-eastern extremity, where the coast is somewhat higher and more abrupt. As a rule, Borneo is bordered throughout by a considerable width of swamps and lowlands, except at a few points where there are high

General charts 941b, 942a, 1263.

promontories or a small extent of hilly country. The largest rivers are the Kapuas, in Pontianak on the west, the Barito in Banjarmasin on the south, with the Kutei, Berau, Bulungan, and Sesajap on the east. All these rivers appear to rise near the centre of the island; they have countless tributaries, and in the lower parts of their courses, flow in very winding channels through a vast extent of forest-covered and swampy alluvial plains.

The aborigines of Borneo are of Malay race, and generally known as Dyaks, but are divided into numerous tribes, speaking distinct languages and having different appellations. They hardly differ physically from other Malays, except in being somewhat lighter in hue and more active, and generally of a more cheerful and childlike disposition.

Several other peoples have settled in Borneo, which, from its central position, has naturally become the receptacle of wanderers from the surrounding islands. From Java there has evidently been a considerable immigration, though these have not kept distinct, but become merged in the Malay and Dyak tribes. The Bugis of Celebes have also made considerable settlements on the south and east of Borneo, and are particularly numerous on the rivers Pasir and Kutei, where they are the chief traders. Farther north are the settlements of the Sulus, who speak the Bisayan language of the Philippines, and who hold an extensive tract of country around Tanjong Unsang. A number of these people are also settled on the coast and rivers near Bruni, where they are known as Bisayas from the language they speak.

The only other people who have settled in Borneo in large numbers are the Chinese, who are to be found in every town on the island, either as traders, miners, mechanics, or agriculturists. The estimated population of Dutch Borneo is about one and a quarter millions; 42,000 of them being Chinese.

The Dutch possessions in Borneo are divided into a western, and a southern and eastern district, each administered by a Resident, at Pontianak and Banjarmasin, respectively. The western district consists of four sub-divisions, viz.: Sambas, Montrado, Pontianak, and Sintang, each under an Assistant Resident, and comprising many native states, all nominally subject to the Dutch, but in several instances under their own princes.

The southern and eastern district has six sub-divisions, viz.: Sam-pit, Banjarmasin and neighbourhood, Martapura, Amuntai, Dusan and Dyak lands, and Kutei and the east coast, which latter is composed of seven independent states. Each of these sub-divisions is administered by an Assistant Resident, but the independent states, beyond acknowledging the Netherlands supremacy, are completely under the control of their own sultans and princes.

General chart 1263.

The chief place of the southern district is **Banjermasin**, one of the oldest trading ports in Borneo, situated at the junction of the **Martapura** river with the **Barito**, and about 14 miles from the mouth of the latter stream. The population in 1882 was estimated at 38,000, many of whom are Chinese, the rest Malays. The inhabitants of the upper waters of the **Barito** and of the **Kutei** rivers are mostly **Kyans**, distinguished from the **Dyaks** to the westward by being tattooed. To the eastward of **Banjermasin** is **Martapura**, where are extensive coal mines.

Borneo is essentially an equatorial region, hot and moist, under the influence of the monsoons. The climate of the coast is, however, healthy, the temperature rising from 72° at sunrise to 90° or 92° at 3 p.m., and 82° at sunset, but the nights are damp. Inland the temperature is higher, and the climate unhealthy, violent fevers and dysentery, probably attributable to bad river water, are prevalent.

Trade is chiefly in the hands of Chinese, who are established at the shipping ports, and buy up all the produce of the interior from Malays, and these again from the forest tribes who collect it. The chief exports consist of copra, cocoanut oil, gums, gutta-percha, rattan, rice, sago, tobacco, and trepang. In 1909 the exports, from Dutch possessions, were valued at £2,817,966; imports £935,062.

CELEBES is the fourth island in magnitude in the archipelago, being only surpassed by Borneo, New Guinea, and Sumatra. Its shape is most peculiar and fantastic, unlike that of any other island, except the much smaller **Gillolo** to the eastward. It consists of a central body, from which radiate four long and narrow arms, forming three deep gulfs on the east side, while the west side has curved and nearly even coastline. The greatest length between the extremities of the northern and southern peninsulas is about 550 miles, the average breadth of these peninsulas being about 60 miles. The two eastern peninsulas are shorter and wider than the others.

Very little is known of the interior of Celebes except at its northern and southern extremities, but it is certain that each of its peninsulas is traversed by a mountain chain, while the central mass is probably a mountainous table land. The extremity of the northern peninsula is the only part where active volcanoes are known to exist, the loftiest of these, **Mount Klabat**, having an altitude of 6,635 feet.

The rivers of Celebes are necessarily small, the largest being the **Sadang**, which is supposed to rise in the central plateau, and enters the sea on the west coast a little north of **Pare Pare** bay, after a course of about 160 miles. The **Sungi Chinrana**, which has its mouth on the east side of the southern peninsula, north of **Boni**, is navigable for good-sized native vessels as far as **Lake Labaya**, a distance of about 20 miles. There are many lakes in the interior, all supplying streams to the sea.

By far the best known and the most important of the Celebesian peninsulas is the south-western, or that which has the Gulf of Boni to the east, and Makassar strait to the west. Reckoning from the bottom of Boni gulf its length is not less than 180 miles, but the breadth does not exceed 70 miles. A chain of mountains runs through this, as through the other peninsulas, and has towards its southern extremity Mount Lampo Batang, about 9,900 feet high, and said to be the highest point of the whole island.

The town of Makassar on the south-western extremity of this peninsula is, next to Batavia and Surabaya, the most important place of trade in the Dutch East Indies. Traders from all parts of the archipelago resort there for the purpose of bartering their products for those of Europe.

The northern peninsula, reckoning from Palos bay to its extremity, extends over 6° of longitude, being a long and narrow strip of land, nowhere exceeding 40 miles in breadth. A range of mountains run through it, the general height being about 2,000 feet, while some peaks rise to 4,000, 5,000, and 6,700 feet; the whole of the peninsula is rugged and mountainous. The north-eastern extremity constitutes the fertile and highly cultivated district of Minahasa, the capital of which is Menado. A considerable portion of Minahasa is a plateau from 2,500 to 3,000 feet above the sea, with mountains rising to 6,000 feet or more; this plateau is exceedingly fertile, producing abundant crops of rice, coffee, and oranges.

The eastern peninsula of Celebes, or that which has the Gulf of Tomini to the north and Tomori to the south, is the least known. Its length extends through 3° of longitude, and its average breadth is about 45 miles. A chain of islands stretches due east of this peninsula for about 200 miles; these islands are nominally subject to Ternate, but both geographically and zoologically they belong to Celebes.

The south-eastern peninsula, separating the Gulfs of Tomini and Boni, is about 150 miles in length and 40 to 80 miles in breadth; at its extremity are the islands of Buton and Muna, beyond which stretch eastward the group of islets called Tukang Besi; all these islands are mountainous and but little known; they are inhabited by Mohammedan Malays speaking a peculiar language.

It is highly probable that a low and primitive race did once inhabit Celebes; but if so it has completely disappeared, and the whole island is now occupied by many distinct tribes in various stages of civilisation, but all belonging to the Malayan race. They may be roughly classed into two groups—the Mohammedan semi-civilised tribes, and the Pagans, who are all more or less savages. The former all read and write, and mostly use peculiar alphabetic characters; they have fixed governments, regular clothing, and are considerably advanced in agriculture and the arts, being, in fact, the equals of the true

General chart 1263.

Malays. The latter are more or less complete savages, without writing or fixed governments, usually with imperfect bark clothing, and without the arts of weaving or working metals.

The most important of the Mohammedan tribes are the Bugis, Mandars, and Makassars. The Bugis occupy the eastern coast and a great deal of the interior of the southern peninsula, their chief town being Boni. They are governed by a Rajah, and have a peculiar language and character. The Mandars, speaking another language, occupy the western portion of the island which projects out into Makassar strait north of Tanjong Mandar. The Makassars inhabit the southern and western extremity of the peninsula. Their chief town, and the residence of the Rajah, is Goa, only a few miles from Makassar, the Dutch capital of Southern Celebes. The Makassar people speak a quite distinct language, and even the character in which they write it differs from that used by the Bugis. Allied people, but speaking two distinct languages, inhabit the islands of Salayar, at the extremity of the southern, and Buton off the end of the south-eastern peninsula.

In 1905 the estimated population of Celebes was 1,851,905.

For purposes of administration Celebes is divided into three Residencies. (i.) The Government of Celebes and its dependencies, which include the coast bordering on Makassar strait and Boni gulf, and the off-lying islands Salayar, Buton, and Muna. About one-third of the south-west peninsula is directly under Dutch rule, the remainder consisting of a confederacy of native states in alliance with the Dutch. (ii.) The Residency of Menado (*Lat. 1° 30' N., Long. 124° 50' E.*), which comprises the northern peninsula and the coasts of Gorontalo gulf, and the Sangir islands. Of this Residency, Minahasa is entirely under the Government, while the Assistant Residency of Gorontalo consists of a number of independent native states. (iii.) The Residency of Ternate, which includes the remainder of the eastern peninsulas, with the Sula and other islands of the east coasts.

Trade.—The principal exports from Celebes are coffee, copra, gums, hides, nutmegs, rattan, together with bird of Paradise skins and trepang which come chiefly from New Guinea. Ponies are also exported in considerable numbers.

RAILWAYS are confined to, and extend the whole length of Java, from Anjer to Banjuwangi, with branch lines to the principal ports on the north and south coasts.

TELEGRAPHS.—All towns of importance in Java are joined by telegraph; there is also a considerable extension of long-distance telephone communication.

A submarine cable connects Batavia with the Cocos islands, and thence with Perth, Australia, Mauritius, South Africa, and Zanzibar. Submarine cables also connect Java with Sumatra, Singapore, and

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Roebuck bay and Port Darwin in Australia; also Banjarmasin in Borneo, and Makassar in Celebes. Makassar is also connected with Balikpapan in Borneo, and Yap in the Caroline islands.

DOCKYARD.—The Dutch Government dockyard and naval establishments are at Surabaya.

DOCKS.—Government docks are all at Surabaya. Private docks are at Batavia (Tanjong Priok) and Surabaya. *See also Appendix I.*

COAL.—Large supplies of coal are obtainable at Batavia, Samarang, Surabaya, and Banjuwangi in Java; Setagin in Borneo; Buton in Celebes; and Koepang in Timor.

COMMUNICATION with Europe is weekly, by two Dutch companies, to and from Batavia; and by the Ocean line from Liverpool. Also viâ Singapore by other lines, as well as to Australia, by British India Company.

INTERCOLONIAL SERVICES OF THE NETHERLANDS ROYAL STEAM
PACKET COMPANY.

1. Every fortnight, from Batavia to Padang, Olehleh, Penang, and back; calling, both ways, at Telok Betung, Kroe, Benkulen, Sigli, Semawe, and Langsa; Engano is visited occasionally.

1A. Every fortnight, from Batavia to Padang, and back; calling at Telok Betung and Benkulen on the outward voyage, and at Bintuhan and Benkulen on the return. Manna is visited every fourth voyage.

2. Every fortnight, from Padang to Olehleh, Penang, and Singapore; calling both ways, at Siboga, Baros, Singkel, Sinabang, Tapa Tuan, Meulaboh, and Chalang; on alternate voyages also at Priaman, Ajer-Bangis, Natal, and Pulu-Tello, Telok-Dalem, Nako islands, Lahewa, Gunung-Situli.

3. Every week, from Batavia to Singapore and back; calling at Tanjong Pandan both ways and Rhio every other voyage.

4. Every fortnight, from Batavia to Semarang and back; calling at Cheribon on the outward voyage, and every fortnight from Batavia to Palembang and Jambie, and back, calling at Muara Saba.

4A. Every week, from Batavia to Palembang and back; calling at Tobo Ali and Muntok on the outward voyage; on the return Muntok is called at, and Tobo Ali and Sungei Slan alternately.

4B. Twice a month, from Batavia to Singapore and back; calling, both ways, at Tobo Ali, Koba, Pangkal Pinang, Liat, Blinyu, Jibuse, and Muntok. Every fortnight from Batavia to Palembang and back, calling at Mengala.

5. Every fortnight, from Singapore to Belawan, Deli, and back; calling, both ways, at Bengkalis, Paneh, and Asahan. Siak is visited every fourth outward voyage.

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6. Twice a month, from Batavia to Pontianak, Kartiasa, and back, calling at Tanjong Pandan and Singkawang, Pemanghat, on alternate voyages.

7. Every week, from Batavia to Semarang and Surabaya, and back. Cheribon, Tegal, and Pekalongan, are touched at once a fortnight in both directions.

8. Every week, from Singapore to Surabaya, Banjarmasin, Samarinda, and back; calling at Stagen, Kota Baru, and Bawean.

9. Every fortnight, from Singapore to Batavia, Semarang, Surabaya, Makassar, Menado, Gorontalo, and ports in the Gulf of Tomini. On this route ports on the west and north coasts of Celebes are visited, also Siau island and Ternate.

10. Every fortnight, from Makassar to the Gulf of Boni and back; calling at Bonthain, Salayar, Sinjai, Bajoa, Palima, Palopo, Malili. Kolaka is visited every other voyage.

10A. Monthly, from Makassar to Luwuk and Gorontalo and back; calling at Buton, Muna, Kandari, Salabangka, Bunko, Kolono, Bangai Archipelago, and Bunta.

11. Every month, from Surabaya to Damma; calling at Ampenan, Sumbawa, Bima, Waingapu, Ende, Savu, Rotti, Koepang, Atapopa, Dilhi, Ilwaki, Kissa, and Letti.

12. Every four weeks, from Singapore to Batavia, Surabaya, Buleleng, Makassar, and Amboina, and thence to the Banda and Tenimber islands.

From Batavia, once a month by the Java-Australia line to eastern ports of Australia and Melbourne and back; calling at Semarang, Surabaya, Port Moresby, and Thursday island. Dobo is called at occasionally.

Language.—The Malay language is generally understood, and is everywhere used to communicate between Europeans and natives.

Coinage.—Dutch currency is legal tender over all the Netherlands possessions, the standard coin being the silver guilder equal to 1s. 8d. English. The coins in circulation are as follows: Gold: 10-guilder piece. Silver: 1 dollar piece; 1, $\frac{1}{2}$, and $\frac{1}{4}$ -guilder pieces; 10 and 5 cent pieces. Copper: 2 $\frac{1}{2}$, 1, and $\frac{1}{2}$ cent pieces.

Fishing stakes ("Seros") are of two kinds; the first are tree trunks driven into the mud, and sometimes stand in 25 feet of water. The second are screens of bamboo laced over poles; these are always on banks which dry.

Charts 2931-2934, Winds, Atlantic, Pacific, and Indian oceans.

WINDS AND WEATHER.—The entire region treated in this work is within the range of the north-west and south-east monsoons. The season of the south-east monsoon is from April to October, and the north-west monsoon from November to March; these periods correspond with the south-west and north-east monsoons north

General charts 941a, 941b, 1263, 2759a.

Charts 2931-2934, Winds, Atlantic, Pacific, and Indian oceans.

of the equator. Within the influence of the land the winds are considerably modified by the direction of the coast line, and in all confined channels, avoiding the obstructions of the land and following the smooth surface of the water, they will draw through with increased force.

In the south-east monsoon the air is laden with particles of dust, brought from the hot sandy plains of Australia, and distant objects may then be entirely hidden; in the other season, although often overcast and cloudy, the sky will, after rain, be bright and clear.

The south-east monsoon, in Sunda strait, blows from south-south-east to south-east, but is only constant during August and September. Thunder storms are more frequent here than in any other part of the archipelago. Southward of Java in this season winds blow unsteadily from east to south, between April and October, shifting to south-south-west in the last two months of the year; light showers may be expected, but away from the coast the amount of rain is very small.

In the Java sea winds will blow for seven months, from April to November, from east-south-east in the western part, from east in the centre, and east-south-east to south-east over the eastern portion. Between Celebes and Timor the monsoon blows with force and steadiness up to October.

Through the great northern passages of Molucca sea, and the straits of Makassar and Carimata, the south-east winds will draw through to the northward and finally join the south-west monsoon of the Pacific ocean and China sea.

The north-west monsoon blows from south-west to west-north-west in Sunda strait, between November and April, and is stronger and more reliable than the south-east wind, and rain is most abundant. On the south coast of Java, south-westerly wind currents prevail, and it is only in January and February that west and west-north-west breezes are felt. In Java sea this monsoon, from west-north-west to west, is stronger in force than the south-eastern, and lasts from December to March, with squalls and heavy showers. Southward of the eastern islands, south-west to north-west winds blow, but they are generally feeble and uncertain. On either side of Borneo and Celebes the reverse action of the south-east monsoon occurs, and north-east, north, and north-west winds will merge into the western monsoon of the Java sea. Thunder storms and squalls may be looked for always during the change of seasons.

Land and sea breezes.—On the south-east coast of Sumatra both land and sea breezes are sometimes felt 30 miles from shore, but on the Java coasts they seldom extend off more than about 15 miles. A weak monsoon may be entirely overcome when opposed by either of these winds, but when blowing in strength they merely

General charts 941a, 941b, 1263, 2759a.

Charts 2931-2934, Winds, Atlantic, Pacific, and Indian oceans.

deflect the prevailing wind. In narrow straits these breezes are very baffling; calms are common under high land.

Wet and dry seasons.—In both monsoons, when the more or less vapour-laden air currents meet high ranges of the land, and are forced up the steep slopes, rapid condensation is followed by heavy rainfall, while over low lands they will pass with little loss of moisture, so that at places a short distance apart very different results are registered; on the lee sides of mountains or inlands, in this case, a dry wind will blow. In the open sea off the south coast of Java, the south-east monsoon is nearly rainless, while at Chilachap during June and July 26 inches will fall, and 35 inches at Parigi over the same two months; the greatest amount in the offing is 7 inches during February.

Generally the western monsoon is the rainy season, and the eastern monsoon the dry; in Sunda strait the wettest month is November, and on the east coast of Sumatra December, while in the Java sea it is January in the west, and February over the eastern parts. In Timor sea December and January are wet months, the rest of the year being fine, with no rainfall in July. On the coast of Borneo, and in Makassar strait, the seasons are less marked, and only July can be called a dry month, with January the wettest. In the vicinity of Spermonde archipelago, owing to the high mountains of Celebes eastward, the south-east monsoon is very dry, and the north-western exceptionally wet; at Makassar, in January, the fall is 29 inches, and at Pangajene, 20 miles northward, 34 inches; the driest month is August.

Charts 2939-2950, Monthly currents, Indian ocean.

Currents are mostly wind-drifts, and the surface velocity is greater in the north-west than in the south-east monsoon. Through Sunda strait a perennial stream runs south-westward from the Java sea, and is turned to the south-east by the current setting eastward along the shores of Sumatra and Java. There is a constant current, of considerable strength, through the strait of Makassar, to the southward, which is pressed south-westward during the south-east monsoon, and south-eastward by the north-west monsoon so that the flow of water through the passages between the islands east of Java is greater to the south than to the north. In Timor sea and southward of the Sunda islands, the direction of the current is about west-south-west at all times. Tidal streams will interrupt or may appear to reverse these conditions.

TIDES.—Along the southern shores of the archipelago, and where open to the Indian ocean, semi-diurnal tides are found, and a port establishment exists. In Molucca and Celebes seas the solar and lunar influences approach an equal value, and the tides entering

General charts 941a, 941b, 1263.

Makassar strait are of very mixed character; at Pulo Laut, at the south-west entrance, being mostly semi-diurnal, while at Makassar they are mainly diurnal.

When diurnal tides predominate the moon's influence is seen mostly in height, and the highest (or spring) tides do not follow the phases of the moon, but depend largely on declination and parallax. Although tidal phenomena are in no way due to the monsoons, it is sometimes convenient to refer them to such well marked periodical seasons.

In the western part of the Java sea the tide is almost exclusively single-daily, with a much greater rise in the northern part than in the southern. Along the Java coast the double-daily tide is not appreciable until eastward of Surabaya strait, with the exception of Boompjes island, where there is a mixed tide. The disappearance of the double-daily tide is probably due to the fact that this tide has high water on the north coast of Madura simultaneously with low water at Tanjong Selatan, on the south coast of Borneo. A similar phenomenon occurs in the western part of the Java sea, between the narrows of Sunda strait and the southern part of Gaspar strait, causing the entire disappearance of the double-daily tide among the Thousand islands.

The tidal movement along the south coast of Borneo is imperfectly known, owing to the lack of observations in the western part, but the fact that the double-daily tide is more pronounced here than along the Java coast is due to the inflow of that tide from Makassar strait.

The main tidal wave is composed of many undulations, entering through the various passages from the open sea, and as these component waves alter in relative values from point to point, the results will differ greatly at places a comparatively short distance apart. The wave is propagated from east to west, and on the north coast of Java its progress is so slow, that high water at Surabaya strait, which occurs in June at Xh. a.m., reaches Semarang at noon, and does not arrive at Batavia until Xh. p.m.

Over the eastern parts of the archipelago, few and scattered observations only have been made, so that no general laws on tidal movements can be deduced.

The periodical fluctuations in the mean water level are small.

Tidal streams, in open waters, are generally weak, and merely strengthen or reduce currents due to monsoon winds; in contracted passages, however, they may become of considerable importance. In the narrow parts of Sunda strait flood and ebb streams are due to the diurnal tide of Java sea; in the channels leading to Batavia they are only marked during calms of the turning months of the monsoons.

General charts 941a, 941b, 1263, 2759a.

Through the straits east of Java, flood runs north, and ebb south. In Madura strait, flood is west, ebb east. In the southern part of Makassar strait, flood runs north, and ebb south.

UNIFORM SYSTEM OF BUOYAGE of the Netherlands East Indies:—

1. The term starboard hand means that side which would be on the right hand going with the main stream of flood, or in entering a harbour, river, or estuary, from seaward; the term port hand means the left hand side, under the same circumstances.
2. Conical (nun) buoys are starboard hand buoys as thus defined, and are painted red.
3. Can (truncated) buoys are port hand buoys as thus defined, and are painted black.
4. Spherical buoys mark the ends of middle grounds, or the separation of two channels, and are painted black and red in horizontal stripes, except when they lie between buoys of the same shape and colour, they are then painted conformably to these. Spherical buoys are always surmounted by topmarks, other buoys only in special cases.
5. Direction buoys, lying outside and marking the approach to seaward channels, are of a special shape, and are painted red and black in vertical stripes.
6. Wrecks are marked by conical or can buoys, painted green, according as the wreck lies on the starboard or port side of the fairway. Should the wreck be in mid-channel, it will be marked by a can buoy on one side, and a conical buoy on the other side, which buoys are to be treated as port or starboard hand buoys according to shape.
7. Topmarks are as follows:—
 - A square marks the outer or seaward side of a bank.
 - A cone marks the inner side of a bank.
 - A ball marks the starboard side of the fairway.
 - A truncated cone marks the port side of the fairway.
 - A cross is used as a special mark, and surmounting a spherical buoy indicates that the buoy may be passed on either side.
 - The ball and truncated cone are also used as topmarks for beacons.
 - The topmarks are of the same colour as the buoys or beacons on which they are placed.
8. The buoys of sea channels are numbered consecutively (beginning from seaward), and marked by the first letter of the name of the channel. The numbers and letters are white.

Until the uniform system of buoyage is completed vessels must guard against risk by following the colour of the buoys, white and red on the starboard hand, and black on the port hand, and disregard the shape.

At some places small buoys, wood beacons, projecting marks, &c., are found, the presence of which must not be reckoned on. These do not appear in the buoyage scheme.

Light-vessels.—The Netherlands light-vessels show a riding light from the fore stay, at a height of 6 feet above the rail, in addition to the distinguishing light.

Pilots.—In the ports of Netherlands India the steering commands used by pilots are “Bakboord uit” and “Stuurboord uit” (literally “Port out” and “Starboard out”). These orders apply to the direction to which the ship’s head is to turn, and not to the tiller.

Regulations for foreign men-of-war.—The following regulations relating to foreign men-of-war entering and anchoring in the roads, inlets, harbours, and rivers of Netherlands India have been issued:—

ARTICLE I.

1. Wherever men-of-war are mentioned in the following regulations this term applies to:—

- (a) Any foreign men-of-war belonging to a Power friendly to the Netherlands;
- (b) Any vessel having troops on board belonging to a Power friendly to the Netherlands.

ARTICLE II.

1. A notice of the entrance and anchorage of a foreign man-of-war shall immediately be sent—if possible, by telegraph—to the naval commander-in-chief by the principal civil authority of the place.

In the possessions outside of Java and Madura, similar notice shall also be sent to the Head of the Governmental Administration, in case he be not himself the principal civil authority of the place.

ARTICLE III.

1. To the commander of the foreign man-of-war, the harbour master, or, in his absence, the official acting as such, shall present:—

- (a) A copy of a French, German, or English extract from these regulations.
- (b) A form issued by the naval commander-in-chief in the French, German, or English language containing interrogatories respecting: Flag, charter, name, crew, armament, whence hailing, length of voyage, proposed length of stay, destination, state of health, &c.

2. A copy of the form, duly filled in, shall be transmitted without delay to the naval commander-in-chief and to the Chief of the Governmental Administration.

ARTICLE IV.

1. The crew of foreign men-of-war within the boundaries of the Dutch Indies shall not be allowed to make any hydrographical or land surveys, nor to engage in disembarking drill, nor, except as provided in Article V., to engage in target practice.

2. The crew shall only be allowed to come ashore unarmed, exception being made on behalf of the officers and non-commissioned officers, who are permitted to wear the side arms pertaining to their uniform; the boats belonging to the vessels, when used, as well as their crew, shall be unarmed.

3. The previous clause does not apply to cases of *vis major*.

4. If for particular reasons—for instance, in the case of a funeral on shore—exemption be desired from the prohibition contained in clause 2 of this article, the permission can be obtained in the chief towns of governments from the Head of the Governmental Administration and in other places from the principal civil authority of the place.

ARTICLE V.

1. The commander of a foreign man-of-war staying at Batavia can be granted a permission for rifle practice ashore.

2. The application for the above-mentioned permission shall be made by the said commander to the naval commander-in-chief.

3. In case there be no objection to grant the request the naval commander-in-chief will send a declaration to the said commander acquainting him with place and time where the exercises can be carried on, and with the number of the rifle-ranges which are at his disposal.

4. A naval officer is always attached to the leader of the shooting practice, in order to afford all necessary information respecting the organisation of our rifle-ranges, and to see that the regulations are carried out.

5. The naval commander-in-chief will acquaint the Head of the Governmental Administration by telephone of the foresaid permission, and of the time when the shooting will take place.

ARTICLE VI.

Within the boundaries of Netherlands India foreign men-of-war must respect the existing local regulations.

ARTICLE VII.

1. Should any foreign man-of-war infringe any of the foregoing regulations, the principal civil authority of the place may, if possible

in conjunction with the Central Government, order the vessel to withdraw, and, if necessary, the principal civil authority may use force to compel the vessel to withdraw, but before doing so he must first consult the competent naval and military authorities.

2. In this latter case the competent naval or military authority shall enforce obedience by firing a live shot past the vessel at a distance of about five hundred metres, and then by firing a second shot at about half the distance of the first, and, if necessary, by further firing with live shots over the vessel, or into the rigging, and finally into the hull.

ARTICLE VIII.

1. The Government pilots shall be made acquainted with these regulations, and be advised by the harbour master, or by the official acting as such, whether a salute to the Netherlands flag can be returned, and if so, from what point.

2. They shall, as far as necessary, afford the said commander of the foreign man-of-war with any information he may require with regard to the above-mentioned regulations.

ARTICLE IX.

1. These regulations apply to men-of-war belonging to Powers which are involved in war but on friendly terms with the Netherlands, as long as no other regulations for the maintenance of neutrality have been made during or after the outbreak of war.

2. In case of a war in which the Netherlands are engaged the same regulations will be enforced so long as nothing to the contrary has been decided.

PASSAGES.

ADEN TO SUNDA STRAIT.

Full-power steam route.—During the south-west monsoon, pass north of Sokotra, and on either side of Minikoi island, thence direct, crossing the meridian of 100° E., northward of lat. 5° S. It may be desirable to pass between Engano island and the coast of Sumatra.

In the north-east monsoon the route is between Sokotra and Cape Guardafui; through One-and-a-half-degree channel, southward of Maldivé islands; and on either side of Engano island. Distance, 3,750 miles.

SUNDA STRAIT TO ADEN.

The reverse of the outward route; or, between October and the beginning of May, steam northward along the Sumatra coast to about

See Ocean Passages, and charts 1077, 1078 The World, showing tracks followed by full-powered steam-vessels; and by vessels with sail and low steam power.

5° N., then for the south point of Ceylon, Minikoi, and northward of Sokotra.

CAPE OF GOOD HOPE TO SUNDA STRAIT.

Full-power steam route.—Follow the coast inside the Agulhas current, to Algoa bay, thence the great circle route to Java head. Distance, 5,010 miles.

Sailing route.—April to October.—Crossing the meridian of 20° E. in lat. 39° to 40° S., the course is between those parallels, southward of St. Paul island, to 80° E.; thence to cross 100° E. in lat. 30° S.; and, passing westward of Christmas island, steer for Java head. In June, July, and August, when the easterly monsoon and west-going current are strongest, vessels should make the land well eastward of the head. Distance, 5,870 miles.

October to April.—From St. Paul island, cross the meridian of 95° E., in lat. 30° S., then passing midway between Christmas and Cocos islands, steer for Flat cape, on the west side of Sunda strait, as in this season the east-going current is strong, and westerly winds blow at times with considerable violence. If contrary winds are met with after passing St. Paul, stand northward, through the south-east trade, into the north-west monsoon. Distance, 5,600 miles.

During the changes of monsoons, March-April, and September-October, it is advisable to make easting until Java head bears North.

SUNDA STRAIT TO CAPE OF GOOD HOPE.

Full-power steam route.—Northward of Cocos islands, crossing the meridian of 80° E. in about lat. 18° S., and passing 120 miles southward of Madagascar, and 100 miles from the Natal coast in the strength of the Agulhas current. Distance, 5,200 miles.

Sailing route.—April to October.—Direct, as in steam vessels. From October to April, stand southward into the south-east trade, then direct.

EASTERN ROUTES TO CHINA.

Sailing vessels, bound to China, take the following routes:—

1. While the south-east monsoon is blowing in the Java sea; through Sunda strait, Banka or Gaspar strait, between Anamba and Natuna islands, into the China sea; thence between Paracels and Macclesfield bank to Hong Kong; in thick weather, Banka strait should be taken rather than Gaspar strait.

When the north-east monsoon is likely to commence before reaching Hong Kong, the route is by Gaspar strait, through Palawan passage, and along the coast of Luzon as far as Cape Bolinao; then across to Hong Kong.

See Ocean Passages, and charts 1077, 1078.

2. In October and November; by Sunda, Bali, Lombok, or Alas straits, into the Java sea; through Makassar strait, and Celebes sea; into Sulu sea by Basilan strait, and along the coasts of Mindanao, Negres, and Panay islands; entering the China sea by Mindoro strait, or Verde island passage; thence working along the coast of Luzon to Cape Bolinao or Cape Bojeador, before crossing the sea to Hong Kong.

3. From the end of November to February, inclusive; through Sunda strait, and southward of Borneo to Salayar strait; by Buton passage into Molucca sea; through Pitt passage, and into the Pacific by Gillolo or Dampier straits; then eastward of Pelew islands, and into the China sea between Luzon and Formosa.

4. The above passage may also, by vessels from the Cape of Good Hope, be made by entering Flores sea northward of Timor island. From St. Paul island, enter the south-east trade in about 110° E., and after passing N.W. cape, of Australia, steer eastward of Sumba island, through Ombai passage into Flores sea; and by Bouro or Manipa strait to Pitt passage.

CARIMATA STRAIT OR BATAVIA TO NORTH COAST OF AUSTRALIA.

Steamships and sailing vessels, in the north-west monsoon, proceed north of Java, through Sapudi strait, and into the Indian ocean by Lombok, or Alas straits; thence south of Timor, into the Arafura sea.

Steamships only can make this passage in the south-east monsoon; their route is through Sapudi strait, and northward of the islands in about 8° S.; then by Wetta passage, and southward of Serwatti islands. This course is sometimes adopted by steamships, in the north-west monsoon.

See Ocean Passages, and charts 1077, 1078.

CHAPTER II.

COCOS ISLANDS AND CHRISTMAS ISLAND.

VARIATION IN 1914.—Increasing about five minutes annually at Cocos islands, and three minutes annually at Christmas island.

Chart 2510, Cocos or Keeling islands. Var. 2° 50' W.

COCOS OR KEELING ISLANDS (*Lat. 11° 49' to 12° 12' S., Long. 96° 49' to 96° 56' E.*) are situated about 600 miles in a south-westerly direction from Java head, nearly in the direct route of vessels viâ the Cape of Good Hope. They are in two distinct divisions, lying north and south, having a channel between about 15 miles wide.

These islands were discovered in 1608 by Captain William Keeling in the service of the East India Company, but were little known previous to the visit of Captain J. Clunies Ross, of the ship *Borneo*, who partially refitted his ship here in 1825.

Captain Ross returned to the islands in 1827 with some Scotch colonists, but found them occupied by Alexander Hare, who, with a large number of Malay followers, had arrived the same year. The two factions lived on bad terms, and many of Ross' colonists left the place owing to its being already occupied, but eventually the Ross' influence became the stronger, and Hare, deserted by his followers, left. The Ross family now own the islands.

In 1836, the Cocos were visited by Captain Robert Fitzroy, who surveyed the group, the chart of which appears to be still correct in its main features, but the head of the lagoon is shoaling.

In 1857, Captain Stephen G. Fremantle, in H.M.S. *Juno*, formally annexed the group to the British Crown. In 1878 the islands were placed under the government of Ceylon. In 1886 they were transferred to the government of the Straits Settlements, and annexed to the Settlement of Singapore in 1903.

South Keeling.—The northern division consists of one island only, whilst the southern division or South Keeling, numbering about 20, form a roughly broken circle nearly approaching the horse-shoe shape common to coral atolls. The two largest islands of this group, named Selma and Ross, are each about 6 miles in length, and are on the south-east and south-west sides of the group. New Selma,

General chart 748b.

Chart 2510, Cocos or Keeling islands. Var. 2° 50' W.

with the settlement of the Cocos and Bantam villages, is on the north-east side. Direction and Horsburgh islands are the northern islets, between which is the channel to Port Refuge.

Outside and nearly all round the group a natural barrier protects the lagoon, rendering it smooth inside. Seaward of this barrier, on which the sea breaks continually, there is a sudden slope into deep water. The greater portion of the lagoon, which is 9 miles in length, by about 6 in width, is filled with patches of growing coral, having deep water between, but it is only navigable by boats.

The land is evidently rising and at some distant time will form a circular island, surrounded by a crater-like edge; at present the land is nowhere more than 20 feet above the sea. The tops of the cocoanut trees, with which the whole of the islands are covered, may be seen from a distance of about 16 miles.

The Eastern Extension Telegraph Company have leased about 40 acres of land on Direction island (*Lat. 12° 5' S., Long. 96° 53' E.*), and have established their offices in the middle of the south side of that island.

Population.—In February, 1907, the ordinary population numbered 693, including 5 Europeans. In addition, there were 17 Europeans and 26 Chinese and Malays belonging to the station of the Eastern Extension Telegraph Company, on Direction island.

Piers.—A pier 600 feet in length, and carrying a light steel tramway, has been built westward of New Selma island, just southward of the Bantam village; a small pier, extending in a southerly direction from the cable house on the south-west side of Direction island, has a depth of 3 fathoms at its extremity.

Light.—A *fixed red* light is shown from the sheers on Direction island pier.

Trade.—The exports are almost entirely confined to copra, which in 1902 amounted in value to about £13,000. The imports are provisions of all kinds, clothes, cutlery, guns, and most necessities of life.

Supplies.—Poultry is not plentiful on the island, but the lagoon abounds with fish; turtle in season are caught, sharks are numerous. A giant clam is found in the lagoon, said to attain a diameter of 6 feet. Jungle fowl are found on most of the large islands; rats, and the white ant, are very destructive. There are a few fruit trees, such as bananas, papaws, guavas, and figs; pumpkins and other vegetables are to be obtained only in small quantities.

General chart 748b.

Chart 2510, Cocos or Keeling islands. Var. 2° 50' W.

Vessels in distress can be assisted or hove down, and receive repairs which are not of great magnitude. A vessel of 178 tons has been built on the island.

Water.—Good fresh water can be obtained almost everywhere by digging to a depth of 8 or 9 feet. Water, of fair quality, can be put on board at the charge of 10s. per ton.

Wireless telegraphy.—A wireless telegraphic station is installed on Direction island, the call letters being M.K.I. It has three masts, one being 160 feet high, and is an excellent landmark for determining the ship's position. It is open to the public at all times.

Communication.—There is telegraphic communication with Batavia, Fremantle in Australia, and with Natal, Seychelles, and Zanzibar, viâ Rodriguez and Mauritius. Produce for the European market is forwarded by a vessel belonging to Mr. Ross. Exports for Batavia are sent every three months by the family schooner, which returns with supplies for the inhabitants. The islands are visited occasionally by one of H.M. ships.

Plan of Port Refuge on 2510.

Port Refuge (*Lat. 12° 5' S., Long. 96° 52' E.*), in the northern portion of the lagoon, consists of an outer and inner anchorage, the latter affording good shelter from the sea in about 7 to 9 fathoms; the outer anchorage has depths of from 6 to 8 fathoms. The inner anchorage is formed on its northern side by a spit with coral patches, partly awash at low water, extending S.W. by W. for 7 cables from the east end of Direction island, and on the southern side by the numerous coral patches of the lagoon, and is a mile in length, with breadths of from 1½ to 3 cables; it is entered by a very narrow channel, between the tongues of the spits, on the south-east side of the outer anchorage.

A detached patch, with about 2½ fathoms water over it, lies immediately westward of the extreme of the northern spit, and several detached shoals, with about the same depth over them, lie on the south-west side of the outer anchorage.

Buoys.—A red spherical buoy, with a cross topmark, is moored in 3 fathoms of water at the northern side of the entrance to the inner harbour.

A red spherical buoy with a cross topmark is moored in 4 fathoms of water on the edge of the reef bounding the northern side of the inner anchorage.

On entering, both buoys should be left close on the port hand.

General chart 748b.

Plan of Port Refuge on 2510. Var. 2° 50' W.

Anchorage.—In 1904, H.M.S. *Diadem* anchored in $7\frac{1}{2}$ fathoms water, with the west extreme of New Selma bearing 141° true, and the north extreme of Direction island 86° true, but as the configuration of the latter island on its northern and south-western side is considerably altered by the cyclone of 1902, it will probably be found that bearings of other objects, taken from this position, may not agree. There is also anchorage in 5 fathoms, with the north tangent of Direction island bearing 81° true, and Prison island 131° true. These anchorages are stated to be unsafe, except with steam ready, as, at times, heavy rollers come in without warning.

The inner anchorage, in 7 to 9 fathoms, with good holding ground of coral and sand, is with the extremes of Direction island bearing about 17° true and 73° true. The passage (*Lat.* $12^\circ 5'S.$, *Long.* $96^\circ 53'E.$) in should not be attempted unless the reefs are plainly visible, and it is advisable to obtain the assistance of Mr. Ross, the proprietor, who has an intimate knowledge of all dangers. It is said that, owing to the growth of weed, the deep water is less easily seen than formerly; and the tidal streams set across the entrance. A second anchor should always be in readiness.

Tides.—It is high water, full and change, at Vh. 30m., rise of tide $4\frac{1}{4}$ feet, the flood setting into the harbour at the rate of $1\frac{1}{2}$ knots. The current running past the islands to the north-westward, about 18 miles per day, is increased by the flood stream; with the ebb the current is counteracted, and there is little or none.

Chart 2510, Cocos or Keeling islands.

Winds.—Weather.—The south-east trade prevails for about 300 days in the year, varying between south and east, and being strongest about August. The months of June, July, and August are the coolest and healthiest, the fresh breezes being accompanied by frequent rains and occasional squalls. September, October, and November are dry months, and the least healthy.

Between November and February, the greater portion of the cyclone period, the trade wind is less steady, being interrupted by calms, storms and variable northerly and westerly winds; and fine days are followed by threatening weather, thunder, and lightning, with violent gusts of wind and heavy showers, causing much anxiety. The weather in March, April, and May is much the same as that of September to November, but not so dry.

Cyclones.—The Cocos are subject to cyclones; in March, 1861, one was experienced, a second, in 1863, devastated the islands, and another, in January, 1876, accompanied by a tidal wave, destroyed the store houses, engine house and mills, and most of the dwellings,

General chart 748b.

Chart 2510, Cocos or Keeling islands. Var. 2° 50' W.

the corrugated roofs of some of them being carried away by the wind for several miles; a slight earthquake accompanied it, causing a black sulphurous fluid to arise in the southern portion of the lagoon, and which, overspreading, destroyed nearly all the fish and corals.

Cyclones were experienced on 4th February, 1894, 4th March, 1902, and 27th November, 1909. This latter cyclone lasted two hours, blowing from the southward with half an hour's calm, and then equally hard from the northward; from this and the readings of the barometer, the lowest reading of which was 27·96, it is evident that the centre of the storm must have passed directly over the islands. A great deal of damage was done, and it is calculated that some 200,000 trees were blown down.

Climate.—The climate of the islands is exceedingly healthy during the greater portion of the year, more especially the months May to September, when it is said to resemble the climate of southern Europe in the summer months.

Previous to introduction of the disease beri-beri, sickness was rarely known, but during the dry season, from September to November, cases of it occur, and diarrhœa is prevalent; and in a less degree in the months of March to May. An epidemic of influenza, in 1894, caused several deaths.

Temperature.—June to September, when the trade wind is strongest, is naturally the coolest season; the temperature then varies from 78° to 80°, occasionally reaching 82°, the night temperature being 73° to 74°.

The hottest months are from December to March, when the trade wind is less regular, the temperature then ranges from 83° to 85°, occasionally reaching 88° to 89°, the night temperature being 76° to 77°; the temperatures during the remaining months are between these. The hot, close nights usually experienced in the tropics are few.

During the strong trade wind, the air is pleasantly dry, there being a difference of 6 to 8 degrees between the wet and dry bulbs, and in September as much as 13° has been observed; even in the opposite season there is usually a difference of 2 to 3 degrees.

The rainfall is moderate; between April and September it occurs as passing showers which often take place at night; during the remainder of the year it is heavier and more frequent, affording a lasting supply to the wells, which are from 5 to 10 feet deep.

Plan of North Keeling island on 2510.

North Keeling (*Lat. 11° 50' S., Long. 96° 49' E.*), 15 miles northward of South Keeling group, is one low island, on a reef, about one mile in length, north and south, by half a mile in breadth. The

General chart 748b.

Plan of North Keeling island on 2510. Var. 2° 50' W.

island is a strip of low coral surrounding a lagoon, and thickly covered with cocoanut trees. There is a small break on the eastern side, but the passage is not available for entering the lagoon. The only landing is on the west or lee side of the island, and is not always practicable on account of the surf. North Keeling is regarded as the sanatorium of the islands. Cases of beri-beri are sent there and put under a course of mineral waters found on the island, in which great faith is placed.

A spit is reported to extend about one mile north-westward from the island, and heavy rollers at times rise suddenly off the south point, making it dangerous to approach. Soundings extend for a distance of 5 miles south-south-west of the island, and also it is said for 3 miles to the eastward.

Supplies.—A few jungle fowl are preserved; the island is also the resort of vast numbers of sea birds. Turtle are found in the lagoon, as well as quantities of various fish, including grey mullet, sharks, and dog-fish; the seine cannot be used with any effect; but there is a fish which may be taken on a rod. A small store of tinned provisions and spirits is kept in a hut for the relief of ship-wrecked persons. Good water may be obtained from a well near the landing place.

Anchorage.—In 1902, H.M.S. *Vestal* anchored in 5 fathoms about 2 cables from the shore, with the west extreme of the island bearing 179° true. The anchorage is not good, however, and a vessel must be ready to proceed to sea if the wind shifts to the westward of north, as rollers are very liable to set in.

Chart 941a, Eastern archipelago, western portion. Var. 0° 25' W.

CHRISTMAS ISLAND (*Lat. 10° 29' S., Long. 105° 38' E.*) is near the track of sailing vessels approaching Sunda strait from the Cape of Good Hope between April and September; also to those bound southward from Sunda strait, during the period of the north-western monsoon.

In June, 1888, the island was annexed to the British Crown by Captain W. H. May, R.N., in H.M.S. *Imperieuse*. It is a dependency of the Straits Settlements.

The island, of limestone formation, densely wooded and steep-to, is 13 miles in length, in a north-east and south-west direction; it attains a height near its western end of 1,170 feet, and near the north-east point 935 feet, and in clear weather may be seen from a distance of 30 miles or more. It is quadrangular in shape, the north, south, and east sides being each about 9 miles in length, and the west 4 miles. Seen from the northward or southward, it is saddle-shaped, the middle

General chart 748b.

Chart 941a, Eastern archipelago, western portion. Var. 0° 25' W.

being considerably lower than the east and west portions; and from the sea the island rises to a central plateau in successive terraces and cliffs. The sea face of the island is composed of perpendicular and almost continuous cliffs, 20 to 40 feet high, much underworn in places, rendering the island inaccessible, except where the cliff has crumbled away and formed rough beaches, on which, when it is the lee side, landing may at times be effected. At Steep point, on the east side, the cliff is 150 feet high; in other parts the coast is undermined by caves ending in vents or "blow holes," some distance from the sea, through which columns of spray are driven 60 or 70 feet into the air. Except in Flying Fish cove, the depths at one cable or less off-shore are about 100 fathoms, affording no anchorage. Depths of about 1,000 fathoms are found from 2 to 3 miles from the land; the bottom off the east side is of a volcanic nature.

A settlement, in Flying Fish cove, was first formed in 1888, when cocoanuts were planted along the water side, and coffee, cocoa, and pepper in clearings behind; these have all thriven and grow in profusion. Fish is fairly plentiful; water is obtained from wells, and is stored in reservoirs at the settlement.

Large deposits of phosphate of lime exist on the island. The material is conveyed by a cable tramway, about $1\frac{1}{2}$ miles long, to the shipping place in Flying Fish cove; the full trucks descending raise to the summit those which are empty. In 1911 over 150,000 tons of phosphate were exported, chiefly to Japan and Sweden.

Winds and weather.—The south-east trade blows almost uninterruptedly from May to December, but in the earlier months of the year—when the north-west monsoon is blowing on the south coast of Sumatra—the southern fringe of the monsoon is nearly always marked by a cloud bank on the northern horizon; this occasionally overlaps the island, bringing heavy rains, and the wind will shift to the northward, sometimes blowing very hard. At this time a heavy sea generally beats with great violence upon the western coasts, and landing is often impracticable.

From two years' observations (1901-3) east winds blew for 145 days, south-east 44, north-east 27, north-west 21, and north 16 days. Southerly and westerly winds were slight, and calms prevailed for 94 days.

Hurricanes are unknown, and thunderstorms rare.

The climate is healthy and pleasant, resembling a dry English summer. Mean reading of the barometer is 29.91 inches, varying about one-tenth of an inch each way. Extreme temperatures are—maximum 94° (Fahr.) in January, minimum 67° in September. Mean maximum 87°, mean minimum 75°. Mean daily range 12°. Most of the rainfall

General chart 745b.

Chart 941a, Eastern archipelago, western portion. Var. $0^{\circ} 25' W.$ occurs from December to May, and in July, at other times there are very heavy dews and occasional showers, the latter being most frequent on the uplands. The annual rainfall is 72 inches.

Plan of Flying Fish cove on 3504.

Flying Fish cove (*Lat. $10^{\circ} 25' S.$, Long. $105^{\circ} 43' E.$*).—The north side of Christmas island, between North-west and Rocky points, forms a curve about 2 miles in depth, and in the eastern corner is Flying Fish cove, a bight 5 cables across, between Smith and Loading points, and $2\frac{1}{2}$ cables deep. A coral shelf, with white sand, fronts the beach of the cove, and extends off one cable into a depth of 5 fathoms; beyond this the water deepens very rapidly, there being over 70 fathoms 2 cables from the high-water line, the bottom rocky and uneven.

Under the direction of the pilot employed by the Phosphate company, there is room, during the fine season, for three or four ships of considerable size to moor. When the trade is strong some swell is felt in the cove, but in light winds the water is smooth.

Mooring buoys.—Piers.—There are several mooring buoys, for stern-fasts, and in the western part of the cove, smaller buoys for the use of lighters. There are also two loading piers, each 70 feet long, with ample water alongside; ships lie 10 feet off, and cargo is rapidly delivered direct, by shoots. It is proposed to erect another pier further to the southward. In the fine season a vessel has loaded 5,300 tons of phosphate in $3\frac{1}{2}$ days, with no night work.

Anchorage.—It is usual to approach the bank very slowly, with an anchor lowered from 30 to 60 fathoms, according to size of ship; when the anchor holds the vessel is backed or warped, to the beach, and secured to a buoy, or to trees on the shore.

Owing to the exposed conditions of the anchorage every precaution must be taken for the safety of the ship; if making more than the briefest stay a second anchor should be down, and fires always banked, with steam ready at short notice.

Ships should not attempt to make the anchorage at night, nor until the pilot is on board. A red flag is hoisted at the storage shed when the anchorage is dangerous.

Landing.—The landing in Flying Fish cove is in the middle of the beach, through a break in the fringing reef. Also on a similar beach, 2 miles eastward of North-west point, a narrow sandy channel about 80 feet in length, gives direct access to the shore.

A new anchorage is reported to be found on the south-east side of the island, which it is hoped may prove of value in westerly winds.

General charts 941a, 748b.

Plan of Flying Fish cove on 3504. Var. 0° 25' W.

This anchorage is frequently used by small steam vessels during westerly winds; passengers are then landed here and walk across to the settlement.

Settlement.—The settlement of the Christmas island Phosphate company, situated in Flying Fish cove, consists of houses for the Europeans and quarters for the Chinese and Malay employés, also store-houses and hospitals. Over 1,200 coolies are employed. There is a Straits Settlements District officer resident in the island, and a doctor is employed by the company. A magistrate's house and police station have been erected. A meteorological station was established here in 1901 by the Christmas Phosphate company; a complete record of observations made since that date up to the present time has been kept.

Shipping.—Vessels of a tonnage of 68,011 tons cleared from the port in 1910.

Communication.—Christmas island is in fortnightly communication with Singapore by the Phosphate company's steamer.

Supplies.—Stores for the settlement are brought once a month. Pigeons are numerous and easily taken, and gannets, frigate, and other sea birds are plentiful. Turtles deposit their eggs on the beaches. Ships cannot depend on being supplied with either provisions, water, coals, or stores. Tinned provisions are expensive; fruit or vegetables are not obtainable.

Population.—In 1910 the population was 1,329, of which 22 were Europeans; it includes 4 white women and 18 white men. In that year there were 21 deaths, of which 8 were due to beri-beri. There is a resident District officer.

Tides.—It is high water, full and change, in Flying Fish cove (*Lat. 10° 25' S., Long. 105° 43' E.*), at VIIh. 20m.; springs rise $4\frac{1}{2}$ feet. The flood tide flows to the north-eastward, the ebb to the south-westward, the latter sometimes attaining a speed of 2 knots.

General charts 941a, 748b.

CHAPTER III.

SUNDA STRAIT.

VARIATION IN 1914.—Decreasing three minutes annually.

Chart 2056, Sunda strait. Var. 0° 30' E.

GENERAL DESCRIPTION.—Sunda strait, through which passes a large portion of the trade of China, also most of the trade of Batavia, Singapore, and other ports in the Java and China seas, separates the large islands of Java and Sumatra. The western entrance between Java head and Tanjong Rada, in Sumatra, is 58 miles 331° true; and from the western to the eastern limit, between St. Nicolas point and the opposite coast of Sumatra, the distance is 70 miles, the general direction of traffic being about north-east and south-west. The narrowest part of the strait, 13 miles across, is abreast Fourth point, being here divided into two channels, each about 4 miles wide, by Thwartway island.

In the strait several islands form channels, by which it may be entered from the westward; but Princes and Great channels, both on the south side, are those most commonly used.

Great channel is limited on the north side by the conspicuous Krakatoa island (*Lat. $6^{\circ} 9' S.$, Long. $105^{\circ} 26' E.$*), between which and the coast of Sumatra are three channels, formed by Sebesi and Sebuks islands, all now very dangerous and to be avoided.

Winds.—Owing to the direction of the strait, which induces the winds to draw through to the northward, the westerly monsoon blows stronger and more steadily than the easterly. The easterly monsoon begins in April, but unsettled weather, and winds shifting occasionally to south-west and north-west, continue during May, June, and July. In August and September the monsoon is at its height and blows constantly between south-south-east and east-south-east; especially at night under the coast of Java, when the land breeze comes off from the same quarter. In daytime, during these months, the sea breeze from the opposite direction will cause the wind to become unsteady on approaching the Java shore.

Towards the end of October westerly winds begin to appear, and at times blow from south-south-west to south-west; but the monsoon

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Chart 2056, Sunda strait. Var. $0^{\circ} 30' E$.

only becomes permanent in the latter half of November, with the wind between south-west and west-north-west. In December the general direction is west-south-west, in January west, and February west-north-west. In March the monsoon begins to abate, and the direction shifts back to west-south-west, with occasional variable winds.

Calms are most frequent in March.

Showers fall at all seasons, but most abundantly in the westerly monsoon, being then often accompanied by thunderstorms.

From May to November the sky is hazy, particularly during the early hours of the day.

Considerable swell rolls into the strait in December, January, and February, and the sea is heaviest when the tide stream, combining with the prevailing south-westerly current, runs contrary to the wind.

In the northern approach to the strait, more markedly on the Sumatra side, during the easterly monsoon, the sea breeze from northward in the Java sea, will in daytime draw the wind into the north-east; at such times, with an adverse tide, it would be advisable for sailing vessels to anchor under the Java shore.

Tides. — Currents. — At Fourth point (*Lat. $6^{\circ} 4' S$, Long. $105^{\circ} 53' E$*) it is high water, full and change, at VIIh. 12m., the highest tide is three days after full and change, and the rise $2\frac{3}{4}$ feet. At neaps the range is 8 inches, and occurs three days after first and third quarters.

Through the narrow parts of Sunda strait a constant current runs south-westward; this is strengthened during one half, and counteracted during the other half of the day, by a strong diurnal tide stream. Early in July the south-west-going tidal stream attains its greatest velocity about Xh. p.m., and the north-east-going about Xh. a.m.; the times will daily be sooner at the rate of two hours in each successive month, so that early in January the maximum strength to south-westward will be about Xh. a.m., and north-eastward about Xh. p.m.

These streams are strongest one day after that on which the moon's declination is greatest, and feeblest when the moon is near the equator.

When the current and tidal stream are in opposition, there will necessarily appear varying and conflicting movements of the surface waters; generally the effect is to check the current, or slightly turn it to the north-eastward.

Southward of Fourth point the combined streams seldom exceed a rate of 2 knots, but between Thwartway island and Java, as well as near St. Nicolas point, it may reach 2 to 4 knots. On the Zutphen islands side of the channel also, a strength of 4 knots will sometimes

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 10' E.

be found, running past the islands towards Varkenshoek; thence with less force in the wider part of the strait.

Bank.—A bank, with 30 fathoms least water, extends 6 miles southward, from lat. 6° 14' S., long. 104° 42' E. Soundings of 160 and 275 fathoms, respectively, were obtained 2½ and 4 miles southward of the bank.

SOUTHERN SHORE.—JAVA HEAD (Tanjong Gedeh) (Lat. 6° 45' S., Long. 105° 12' E.), the western extremity of Java, is a bluff promontory at the foot of high land, and is discernible at a considerable distance in clear weather. *See* First point light, page 33.

When making the head in hazy weather, the appearance of the land eastward of Tanjong Sangian Sira, between it and Tanjong Sodong, bears much resemblance to that of the west point of Java, with the adjacent hills on Princes island; and the low land in such circumstances not being distinguishable at a distance, the position of it has been mistaken for the entrance to Princes channel. *See* view on 2056.

Tanjong Sangian Sira.—From Java head the coast trends 159° true 5 miles to Tanjong Sangian Sira, high, with two large rocks close to. One mile south-east of the cape is a cluster of rocks, above water, and others line the shore, the sea breaking heavily upon them all. The soundings are very deep close to, and nearly up to Java head there is no bottom with 100 fathoms; this coast should not be approached within 2 miles.

Mount Payung, 1,575 feet high, rises over Tanjong Sangian Sira.

Chart 1653, Island of Java.

Deli (Dilih) or Kelapa island, 3 miles long by one broad, is charted 7 miles from the nearest shore of Java, and 21 miles 119° true from the extreme of Tanjong Sangian Sira, but is reported to lie 1½ miles further south-west. It is low and swampy in the middle, covered with large trees (those along the beach being cocoanut), and is surrounded by a reef, which from the west end projects 1½ miles, and in other directions nearly one mile.

Water.—On the north-west side there is a watering place in the south-east monsoon, and boats enter by a channel through the reef.

Anchorage.—Vessels may anchor on the north side in 13 to 15 fathoms, clay bottom, close to reefs, which partially dry at low water. The depths are from 30 to 44 fathoms 2 miles south of the island.

Trowers or Tinjil island, 3 miles long, half a mile broad, and thickly wooded, is much in appearance like Deli island, from which it lies 81° true, distant 11 miles. This island is also surrounded by a reef for one mile.

General charts 1653, 2761, 941a, 1263.

Chart 1653, Island of Java. Var. $0^{\circ} 10'$ E.

On the north and west sides of this island there are from 13 to 19 fathoms water, and at the south-east and south sides, at some distance, no bottom at 50 and 100 fathoms. These islands afford no shelter from southerly gales.

A rock, on which vessels have struck, is about one mile north of the island, but the position is uncertain. *See* also page 186.

Chart 2056, Sunda strait.

PRINCES ISLAND (Panaitan), separated from the west end of Java by Princes channel, is the largest island in Sunda strait. Its greatest length, between the west and north-east points, is 12 miles, and its breadth about 7 miles. It is of irregular form, projecting to a point on the north-east side, having a large bay on the south-west side, the horns of which form the west and south points of the island. The middle and eastern parts of the island are hilly, the highest peak, **Mount Rakso** (*Lat. $6^{\circ} 36'$ S., Long. $105^{\circ} 14'$ E.*), 1,048 feet above the level of the sea, being on the eastern shore; but in some parts, particularly at the west end, the land is level and low, fronting the sea; all parts of the island abound in wood.

Princes reefs embrace the south-west point, and extend off $1\frac{1}{2}$ miles, with several rocks above water. Carpenter rocks project a mile from the south point; most of the rocks are above water, and the sea always breaks; the water is deep close to. A fringing reef, enclosing the conspicuous **White rock**, continues north-eastward 4 miles to **Tanjong Semadang**, with a detached breaking reef of coral, one mile south-westward of the point.

Tanjong Parut, the north-east point of the island, is enclosed by a reef; the other shores are generally steep-to.

Kasuaris bay, on the south-west side of the island, is 4 miles deep, and has at its entrance soundings varying from 30 to 50 fathoms, decreasing inside to a convenient depth for anchoring; but, being open to all winds between west and south, it is not frequented, and cannot be recommended. A rock is reported to lie about one mile to the southward of **Tanjong Sabini**, the western entrance point.

Water is said to be procurable, in the north-west monsoon only, from a stream in a small sandy bay under **Mount Rakso**, on the east side of Princes island. The anchorage is in 35 fathoms half a mile from shore, with the hill about 327° true.

PRINCES CHANNEL (Behouden passage of the Dutch), in the narrowest part between Carpenter rocks off the south end of Princes island and Friar rocks off First point of Java, is 3 miles broad; and the passage possesses the great advantage of affording anchorage to vessels when becalmed, which Great channel does not. Light baffling

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 10' E.

winds and calms are very common about the entrances to Sunda strait, occurring even in the strength of the south-east monsoon, and vessels when not able to anchor are liable to be set back by adverse currents.

The depths are much greater on the Princes island than on the Java shore. Near Carpenter rocks there is no bottom at 50 fathoms; towards Mew bay, on the Java shore, the depths decrease to 20 fathoms and less.

Directions.—In the south-east monsoon, when proceeding either way through Princes channel, vessels should keep closer to the Java coast than to Princes island.

In the north-west monsoon it often happens that vessels bound out of the strait get quickly to the westward by proceeding through Princes channel, while those using Great channel are detained by heavy squalls and adverse currents. Indeed, instances have occurred in which vessels have worked through this passage in a remarkably short time during a westerly gale, by carrying a heavy press of sail and tacking between the squalls, when it was impossible for any vessel in Great channel to beat against the current and heavy sea.

In this monsoon, particularly when working out, it is advisable to keep nearer the island shore, to obtain the help of a current sometimes running to the westward, and to avoid being set upon the rocks about Java head by the heavy swell. Near the Java shore, when outside anchorage depths in a calm, vessels would be in considerable danger.

GREAT CHANNEL lies between the north point of Princes island and the south point of Krakatoa island, which are 23 miles apart; although too deep for anchorage, it is much frequented, being the widest passage into the strait, and is considered to be clear of danger. Entering by Great channel, vessels should keep nearer Princes island, and when farther in, borrow on the Java side.

JAVA COAST.—First point (Tanjong Lajar).—The coast between Java head and First point is fronted by high rocks stretching out a considerable distance in some places. First point, the south point of entrance into Princes channel, has a conspicuous rock lying abreast of it, which rises abruptly out of the sea, and is steep-to. Close northward of First point there is another rock above water, which, together with the former, are named Friar rocks.

LIGHT (*Lat. 6° 45' S., Long. 105° 13' E.*).—From a white iron framework support, 65 feet high, erected on First point, is exhibited a *white flashing light every thirty seconds*, thus: *flash, four seconds; eclipse, twenty-six seconds*. It is elevated 165 feet above high water,

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 10' E.

and is visible in clear weather from a distance of 18 miles. For the arc of visibility, *see* Light list and chart.

Mew island (Kanti or Pujang), about 2 miles eastward from First point, is 130 feet high, about $1\frac{1}{2}$ miles north and south, and one mile east and west, hilly and wooded. Between it and First point, and close inshore, is Mew stone, a small rock above water. The shore is rocky on the outside of Mew island, but safe to approach; the soundings decrease gradually to 8 or 9 fathoms.

Between Mew island and the main there is a narrow but safe channel, with depths from 5 to 10 fathoms, sandy bottom. The channel is close over towards Mew island, to avoid Watson bank, which lies near the Java shore. Sometimes the sea breaks upon this bank.

Anchorage.—Water.—To the eastward of Mew island, on the Java shore, there is a good watering place in the south-east monsoon; the water is excellent, and falls in a cataract upon the beach. Large boats may approach this spot at high water through a narrow channel in the reef, and fill by a hose.

A little to the northward of the watering place, and about half a mile from the Java shore, lies a coral reef about a cable in extent. Upon its shoalest part there is one fathom water, and all round from 5 to 6 fathoms. A vessel standing in for the watering place must steer between this reef and the island, and anchor in 9 or 10 fathoms.

In the south-east monsoon there is also a good anchorage a little farther out, in 16 to 19 fathoms water, sandy bottom, with the north point of Mew island bearing about 265° true, and the east point 192° true.

Plenty of wood may be obtained from Mew island or the mainland.

Tides.—It is high water, full and change, at Mew island, at VIh.; springs rise 3 feet.

Tanjong Sinini (Senini) is a broad, low, projecting point, $5\frac{1}{2}$ miles north-eastward of Mew island, with depths of from 14 to 19 fathoms 3 cables off it. The coast between First and Second points is low, wooded, and with here and there sandy beaches.

Second point (*Lat. $6^\circ 39' S.$, Long. $105^\circ 22' E.$*), a low foreland, 12 miles 61° true from First point, may be approached without danger to the distance of one mile, and in from 26 to 20 fathoms water, the reefs projecting but a little way off-shore.

From Mew island towards Second point, reefs project half a cable from the shore, having from 5 to 6 fathoms water close to, which increases rapidly to 10 and 20 fathoms; with due care and attention to the lead, a vessel may approach the shore in order to anchor.

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Chart 2056, Sunda strait. Var. 0° 10' E.

Sometimes native craft may be met, having turtle, fowls, and coconuts for sale.

WELKOMST BAY.—At a distance of 20 miles 61° true from Second point is Third point, and between is a deep bight, named Welkomst bay, which in the south-east monsoon affords good shelter, but should be avoided in the north-west monsoon. There is, however, said to be good anchorage in the north-west monsoon, when the wind is not too northerly, south-eastward of Second point in 9 or 10 fathoms water; but this anchorage should be approached with great caution, as the soundings decrease very suddenly to 2 fathoms on the edge of the reef which fronts the shore between Second and Tembing points.

The west shore of the bay trends from Second point about south-south-east 11 miles, in the middle of which the beach forms a small bight, with 4 fathoms at its entrance, but only one fathom a short distance within. The whole of this side of the bay is skirted by reefs, some parts being one mile distant from the shore.

A large portion of the bay, inside Panter and Rocky ridge reefs, has not been examined, but it is supposed to be dangerous. Andelan (Handulum) and Little Andelan are two islets lying contiguous to the south-west shore of the bay, about 7 miles from Second point. Two sandbanks, each surrounded by a sunken reef, lie from half to three-quarters of a mile off the eastern island, and a rock above water lies about three-quarters of a mile to the north-eastward of the same island. Between these banks and Andelan (*Lat. 6° 45' S., Long. 105° 26' E.*) the depths are from 4 to 6 fathoms, mud; and between that island and the shore from three-quarters to 1½ fathoms.

The distance across from the southern shore of Welkomst bay to the south coast of Java is about one mile, and the sound of the surf may be distinctly heard across the isthmus.

The eastern shore of the bay is 24 miles in length, from the head to Third point, in a direction about north-north-east. From the head to Badui (Badul) islet, a distance of 7 miles, the bay appears to be shallow, and there are many coral rocks southward of the islet, mostly dry at low water, with 7 to 9 fathoms between them. Northward of Badui the coast is bolder with 15 to 24 fathoms 2 miles off; and there are several islets and dangers.

A large coral rock above water, usually covered with a heavy surf, lies 276° true, about 1½ miles from Badui islet; and near it appear to be several reefs. Between the rock and the island the depths are from 6 to 12 fathoms.

Five miles north-eastward of Badui islet is Tanjong Palagan, with some islands off, the southernmost is named Mangir, and the others

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 20' E.

Uwar, Umang, and Sumur. These islands, as well as Tanjong Palagan, are surrounded by reefs a cable in breadth, but one mile outside there is a depth of 15 fathoms, mud. Sumur island is connected to Tanjong Palagan by a reef with not more than 2 feet of water on it.

Mount Honjeg, a double-topped summit, 2,044 feet high, is abreast Badui islet 2½ miles inland.

Rocky ridge, about 100 yards in length, mostly above water, and always covered by breakers, lies about half-way between the western shore of the bay and Panter reefs, with Second point bearing 299° true, distant 4 miles. The depths round are 10 and 12 fathoms.

Panter reefs are the outermost of the known dangers which encumber Welkomst bay, and they lie nearly midway between Second point and Tanjong Palagan. From their north extremity, in 11 fathoms, Second point bears 279° true, distant 6 miles. They consist of four different patches, the whole being from half to three-quarters of a mile in extent. The shoalest patch has a depth of about one fathom, rock, but between and close round them are 9 and 10 fathoms, mud.

Third point (Tanjong Lesung) (*Lat. 6°28' S., Long. 105°40' E.*), like Second point, is very low, although sharper, and fronted by rocks to the distance of 2 cables, from which the depths increase to 10 and 18 fathoms.

Batu Hideung, a hill 4 miles southward of Third point, is 900 feet high, and possibly easily recognised.

PEPER BAY.—Pepoli island is nearly 10 miles north-eastward from Third point, and between is Peper bay. Its shores are fronted by reefs which near the points project about half a mile, increasing their distance from the shore towards the head of the bay, where they extend 1½ miles. The depths in the bay generally decrease uniformly from 14 to 4 fathoms; the latter depth will be found 2 miles off-shore.

Coral bank (Gundul), nearly 2 miles east from Third point, is about 3 cables in length, the greater part is above water. Between this bank and Third point there is a channel 4 to 9 fathoms deep.

Lawungan (Liwungan) islet, at the head of Peper bay, 3½ miles 111° true from Third point, is about three-quarters of a mile long, a quarter of a mile broad, and is surrounded by a reef which projects 1½ cables from the north side of the islet.

Three-quarters of a mile north-westward and westward of Lawungan islet are two reefs, partly dry at low water, and usually breaking.

Southward, and mid-channel between Lawungan islet and the shore, is a reef with 3 feet water, between which and the island there

General charts 1653, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 25' E.

is a narrow channel, with 3 and 4 fathoms; between the reef and the shore is foul ground.

Anchorage.—In the eastern monsoon there is safe anchorage north-east of Lawungan islet, in 6 or 8 fathoms, soft bottom.

Gusong Panjang, one and a half miles south-west of Pepoli island, is one mile long, half a mile in breadth, and has a least depth of 3 feet. This ledge, being steep-to, is dangerous, as the sea does not often break upon it; but it may be distinguished by the light colour of the water, and its brown patches.

Pepoli (Pepoleh) island (*Lat. 6° 24' S., Long. 105° 48' E.*), small, round, and about half a mile in diameter, is within one mile of the shore, and connected by a reef; there is, however, a small channel of $1\frac{1}{2}$ fathoms through this reef, available for boats.

Karang Kebua, about half a mile in extent, 2 miles north of Pepoli island and two-thirds of a mile off-shore near Charingin, is of coral, partly above water, and generally breaks. It is steep-to, having 6 fathoms close outside.

Between this reef and a rock near the shore there is a depth of 3 fathoms.

Anchorage.—A convenient anchorage in 7 fathoms, clay, will be found northward of Karang Kebua, $1\frac{1}{2}$ miles off-shore, with Pepoli bearing 170° true.

The coast from Charingin trends nearly north, and may be approached to a depth of 12 to 15 fathoms. The coast is low, though occasionally interrupted by hills and rocky points. Many streams run into the sea, and there are scattered villages; landing is easy when the surf is not too high. There is anchorage all over the off-lying bank.

Catherine rock, rather more than 4 miles southward of Fourth point, and half a mile off-shore, is about $2\frac{1}{2}$ cables in extent, in the direction of the coast, with two rocky heads above water near the centre, and which are visible about 3 miles. There is a small rock with less than 6 feet 3 cables north-north-west of the rock, with 6 fathoms between. The coast should not be approached within one mile, or in less depth than 12 fathoms. Between Catherine rock and the shore there is said to be 6 fathoms.

Telegraph cable.—The shore end of the submarine telegraph cable from Kalianda, in Sumatra, is landed at a cable house southward of Catherine rock, and 5 miles from Fourth point. Vessels are forbidden to anchor near.

General charts 1653, 941a, 1263.

Plan of Fourth point to Old Anjer on 2056. Var. 0° 30' E.

FOURTH POINT (Tanjong Chikoneng), distant nearly 27 miles north-eastward from Third point, is low and overgrown with brushwood, but easily discerned by the lighthouse. A reef fringes the shore to the distance of one to 2 cables. View at page 38.

LIGHT (Lat. 6° 4' S., Long. 105° 53' E.).—On Fourth point stands a white iron lighthouse, 190 feet high, which exhibits, at an elevation of 180 feet above high water, a *flashing white* light, giving one flash of *five seconds*, followed by *ten seconds* eclipse; and visible in clear weather from a distance of 20 miles.

Tides.—It is high water, full and change, at Fourth point, at VIIh. 12m.; springs rise 2½ feet, neaps 8 inches.

Anjer peak, 1,936 feet in height, is about 4 miles within Fourth point. View at page 38. **Mount Gedeh**, 2 miles southward of Anjer peak, is 2,038 feet high.

ANJER.—Signals.—The settlement at Fourth point (formerly known as Bojong) has been named Anjer, or Anjer Kidul, and the post office, Lloyd's signal and semaphore stations are established here. Vessels will be signalled free of charge to Batavia. There is a railway to Batavia.

Charts and sailing directions for the Netherlands Indies may be procured from the Harbour Master.

Anchorage off Fourth point, is exposed, the holding ground, of coral thinly overlaid with sand and mud, is bad, and only available with easterly winds; one mile from shore the depth is 30 fathoms.

Water.—The mouth of the Kali Chi Koneng can be entered by boats and small vessels when the surf allows; fresh water may be obtained within.

Pilots, for the strait and coast to Batavia, are stationed at Fourth point and at Old Anjer.

Old Anjer (Anjer dor), situated 2½ miles north-eastward of Fourth point, is a thriving village, on the site of the town destroyed in 1883; the inhabitants live by fishing and by attending to the needs of passing ships.

Kali Anjer, close westward of the village, is 40 yards in breadth, with a depth of 6 to 9 feet at low water, and affords good landing for boats in the easterly monsoon; but Kali Paku, half a mile to the northward, which has a least depth of 2 to 3½ fathoms, is to be preferred. The Paku is about 80 yards wide, and has some rocks near the entrance, which may be avoided by keeping close over to the reef extending from the south point.

General charts 1653, 941a, 1263.



Java, west coast; Fourth point.
Fourth point lighthouse, bearing
155° true, 2 m.

Anjer peak.



Lening point.

Java, west coast; Lening point to Fourth point.

Fourth point lighthouse,
bearing 198° true, 24 m.

Mt. Batur, 1814 ft.



St. Nicolas point.

Java, west coast; St. Nicolas point to Merak island.

Merak island, bearing
137° true, 2 m.

Plan of Fourth point to Old Anjer on 2056. Var. 0° 30' E.

Anchorage.—There is anchorage in Anjer road in 14 fathoms, fair holding ground, with Fourth point bearing 223° true; and the summit of Thwartway 319° true, half a mile from the shore reef; from thence the depth decreases uniformly to 8 fathoms about a cable from the reef which fringes the shore. This is but an indifferent roadstead in the north-west monsoon, and a high surf then makes landing dangerous. Sailing vessels have frequently found themselves in dangerous proximity to this reef from anchoring in too small a depth of water, and with no room to veer in the event of sudden and violent squalls, which are frequent in this season.

During the easterly monsoon, small craft will find anchorage in 4 to 5 fathoms, within the entrance of the river, avoiding patches of 2 fathoms (ruins of the old town).

Supplies.—In the south-east monsoon, vessels both outward and inward bound, often call at Anjer for supplies. Buffaloes, poultry, vegetables, fruit, hogs, sheep, turtle, and water are to be procured. Native craft from Anjer, with supplies, may be met with in Sunda strait, and as far northward as the Brothers.

Chart 2056, Sunda strait.

THWARTWAY ISLAND, or **Pulo Sangian** (Lat. 5° 57' S., Long. 105° 51' E.), 505 feet high, in the middle of the narrowest part of Sunda strait, is easily recognised by its irregular shape. From north-eastward or south-westward the island appears as five islets, the earthquake wave having swept through it, destroying all the trees in the low ground and valleys, but there is no change in the contour of the island, or in the depths around. It is 2½ miles long in a north and south direction, and steep-to on the northern and eastern sides beyond 1½ cables distance. Off the southern extremity a reef projects about 3 cables, on which a rock above water is visible; southward of the reef are 13 fathoms. From the south-west point of the island a bank of sand, with depths of from 17 to 20 fathoms, extends in a south-westerly direction for a distance of 6 miles.

Anchorage.—The west side of the island forms a bay, in which there is good temporary anchorage in 13 fathoms, sand, with the extremes of the island 353° true and 119° true. The south-westerly set in Sunda strait causes strong eddies in this bay.

Brabands island, 154 feet high, is a small round island, about a cable in diameter, 5 miles 111° true from the south end of Thwartway island.

A shoal of 2 fathoms lies 2 cables off the Java shore, with Brabands island bearing 305° true, distant one mile.

General charts 1653, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 30' E.

Browers (Bruwers) sand.*—Two patches of $4\frac{1}{2}$ and 5 fathoms, near the end of a tongue of hard sand extending 3 miles 215° true from Merak island, and $1\frac{1}{2}$ miles off the Java shore. Kerungo rock, which dries at low water, is about 2 cables off-shore, abreast Browers sand.

The depths close to the west side of Browers sand are from 10 to 15 fathoms, increasing to 19 and 20 fathoms at the distance of one mile. When standing in-shore, Brabands island should be kept inside of Fourth point.

Anchorage.—Between the shallow parts and Merak island there is convenient anchorage for vessels working through Sunda strait.

Plan of New Anjer road on 2056.

Merak island (Merak besar) (*Lat. $5^\circ 56'$ S., Long. $105^\circ 59'$ E.*), $5\frac{1}{2}$ miles north-east from Brabands island, is 220 feet high, nearly round, and about half a mile in diameter. Within it is New Anjer road.

Little Merak island (Merak kechil), is near the shore, about half a mile south-eastward of Merak island; a large tree stands near the north point. Two small 3-fathom patches lie south-south-eastward of the island at distances of $2\frac{1}{2}$ and $3\frac{1}{2}$ cables.

NEW ANJER ROAD, nearly half a mile in extent, is between Merak islands and the coast of Java.

New Anjer.—A few native huts alone remain of New Anjer, the settlement having been removed to Fourth point.

Tarrembu bank, nearly 2 cables in extent, lies in the south entrance to the road, midway between Merak islands. On its north-western part is a patch nearly a cable in extent, with Tarrembu rock which dries. A patch of $3\frac{1}{4}$ fathoms lies half a cable northward of this rock, and a bank of 4 to $4\frac{3}{4}$ fathoms is $1\frac{1}{2}$ cables north-north-eastward of the rock, and a $5\frac{1}{2}$ -fathom patch a cable further northward.

Beacons and buoys.—A white beacon, surmounted by a ball, marks the western side of Tarrembu reef, and a beacon, surmounted by a black cone, the east point of the coast reef one cable southward of the east point of Merak island. A white conical buoy is moored a cable northward of Tarrembu rock, westward of a $2\frac{3}{4}$ -fathom patch, and a black can buoy about 150 yards eastward of Tarrembu rock, eastward of 3-fathom shoals.

Anchorage.—The anchorage with south-west winds is northward of Tarrembu bank and other patches, in from 8 to 10 fathoms, with the northern hill of Merak bearing 270° true. It is not safe for large vessels in the north-west monsoon, as a heavy swell sometimes sets in, but small vessels will always find shelter under Merak island.

Directions.—The channel north of Merak is the one recom-

*Browers sand, previous to the earthquake, had in one place a depth of only $1\frac{1}{2}$ fathoms, with a general depth of $3\frac{1}{2}$ or 4 fathoms.

General charts 2056, 1653, 941a, 1263.

Plan of New Anjer road on 2056. Var. 0° 30' E.

mended; it is more than a cable in breadth, and has depths of 7 to 10 fathoms. In entering, keep close along the side of Merak island; the small reef fringing it shows discoloured water. Steam vessels may enter by the south channel, on either side of Tarrembu bank, as there are depths of from 5 to 8 fathoms water in both, but it is not practicable for sailing vessels as there is always a strong adverse current.

Chart 2056, Sunda strait.

Java reef.—A small patch of coral, with a depth of $4\frac{1}{2}$ fathoms, and steep to nearly all round, lies with Merak island bearing about 178° true, distant $1\frac{1}{4}$ miles. When the current is running from one to 2 miles an hour, the bank is marked by ripples, and sometimes by discoloured water.

ST. NICOLAS POINT (*Lat. 5° 53' S., Long. 106° 3' E.*).—The coast from Merak island trends in a north-easterly direction about 5 miles to St. Nicolas point, 45 feet high, covered with trees, and the perpendicular extreme of the bold promontory forming the north-west end of Java, which rises to Mount Gedeh, 1,968 feet high. Dangers extend a third of a mile off the point with 11 fathoms close to.

About mid-way between Merak island and St. Nicolas point is the small islet of Tamposo, near the edge of the shore reef, extending off about one-third of a mile; close to there are depths from 10. to 15 fathoms. Between Tamposo and the shore there is shelter for boats and small vessels, in 2 to 5 fathoms. This coast should not be approached nearer than in 18 fathoms, unless seeking anchorage, when wind and current are unfavourable; this may be found off the small bays in 8 to 10 fathoms. View at page 38.

Toppers (Button) island, about one cable in diameter, is 230 feet high, steep, and covered with trees. It lies well out in the fairway of Sunda strait, 5 miles north-east of Thwartway island, and has 15 fathoms close off the south end, and 30 to 40 fathoms at a short distance all round.

CHANNELS.—Between Thwartway and Zutphen islands the channel is 4 miles wide, with two dangers, viz., Stroom rocks off Thwartway, and Winsor rock off Toppers island. Owing to the great depth of water, 40 to 60 fathoms, it is not so convenient as the channel between Thwartway and Java, where the depths being only 20 to 30 fathoms, greater facility is afforded for anchoring in calms. The channel between Thwartway and Sumatra is much frequented in the westerly monsoon by vessels bound to the westward, being shorter although more contracted than the other channel between Thwartway and Java. The former may be adopted with a steady wind, for in such case, with the westerly current, a vessel will get speedily through; but in light baffling winds, she is liable to be drifted about by strong tides or currents near Stroom rocks, where the water is too deep for anchorage.

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Chart 2056, Sunda strait. Var. 0° 30' E.

Stroom rocks (*Lat. 5° 55' S., Long. 105° 49' E.*), 327° true, nearly 2 miles distant from the west point of Thwartway, are a group of rocks with some of their heads just above high water. They are steep-to and at times the breakers over them may be seen at a considerable distance.

The currents which meet here from the north and east are very rapid, and, with the opposite wind, cause such strong eddies as to make it almost appear as if Stroom rocks were connected with Thwartway.

Winsor rock, marked by tide-rips, has a least depth of 2½ fathoms, with other rocks close to, beyond which the depths increase suddenly to 20 and 30 fathoms in all directions. From the rock the summit of Toppers island bears 116° true, distant 1½ miles.

DIRECTIONS.—With a steady and commanding breeze a vessel from about 2 miles off Third point may steer to pass the same distance off Fourth point, westward of Brabands island, taking care not to borrow too close on Browers sand in passing, observing that Fourth point open westward of Brabands island leads westward of it.

The winds, however, frequently become light and variable, and a sailing vessel may be compelled to anchor, in which case it is better to keep well over to the Java shore, avoiding the dangers in Peper bay, which should not be approached under a depth of 14 fathoms.

When the current is running to the westward in the middle of Sunda strait, an eddy will be experienced near the land; besides which, a vessel may anchor anywhere along the shore, except near Fourth point, where the bottom is in places foul and rocky. When working to the north-east, therefore, it is advisable not to keep too far in the offing, in order to make the eddy available, and to retain favourable anchoring ground.

When northward of Toppers island, if bound to Banka strait, sailing vessels usually steer about 12° true for Two Brothers; if bound for Batavia, to pass St. Nicolas point at the distance of 2 miles, and shape course about 99° true midway between Babi island and Tanjong Pontang, and to the entrance of Inner or Dutch channel, the one most frequented by vessels entering Batavia road from the westward. *See page 78.*

SUNDA STRAIT. — NORTHERN SHORE. — The south coast of Sumatra, which forms the north shore of Sunda strait, between Flat cape on the west and Varkenshoek on the east, a distance of 70 miles, is indented by two large bays, named Semangka or Keizer, and Lampong, the shores of both are fronted by numerous islands and rocks.

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 15' E.

Flat cape (Vlakke hoek) is the north-west boundary of Sunda strait; the peninsula of which it is the western extremity separates Semangka bay, on the east side, from Belimbing bay on the west side. The southern coast is low and woody, the east low extreme, Tanjong Rada, is distant 10 miles from Flat cape.

Approaching Flat cape, in thick weather, when the land cannot be seen, the soundings will be a good guide, but it is not advisable to get into less than 20 fathoms.

A reef fringes the shore of Flat cape and thence to Tanjong Rada, but at one mile distant there are depths of 7 to 10 fathoms.

LIGHT (*Lat. 5° 56' S., Long. 104° 33' E.*).—From a white tower 215 feet high, near the extreme of Flat cape is exhibited, 205 feet above high water, a *group flashing white light*, showing *three flashes* each of *two seconds* duration, separated by *three seconds* of darkness, and followed by an eclipse of *eighteen seconds*. The light is visible 21 miles. For the arc of visibility, see Light list and chart.

Tides.—It is high water, full and change, at Flat cape at Vlh. 10m.; springs rise 2 feet.

Seleman rock, on which the sea breaks, has a less depth than 3 fathoms, and lies with Tanjong Seleman bearing 291° true, distant 1½ miles.

Little Fortune island (Batu Kechil) is 281° true 6¼ miles from Flat cape; it is low, woody, about one mile in diameter, and surrounded by a reef; breakers extend a considerable distance off the south-east point.

Breakers reported.—In 1910 breakers were reported at a distance of about 1½ miles, 167° true, from the south-east extreme of Little Fortune island. In the same year breakers were reported at a distance of about one mile, 191° true, from Flat cape lighthouse.

Anchorage.—There is anchorage off the east side of the island in 9 or 10 fathoms.

Sandbank.—At about 3 miles south-westward of Flat cape there is a narrow bank, of reddish sand, 2 miles in length, north-west and south-east, and about one mile in breadth, with depths of 8 and 9 fathoms. The depths seaward increase rapidly to 30 and 50 fathoms, and between the bank and the shore are 12 and 14 fathoms. Four miles west of Flat cape is a doubtful bank of 5 fathoms.

SEMANGKA or KEIZER BAY, on the eastern side of Bengkulen peninsula, extends in a north-westerly direction nearly 30 miles, and is about 20 miles wide at its entrance. The western shore of the bay affords no shelter from south-easterly winds, and

General charts 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 15' E.

has 20 to 30 fathoms water within half a mile of it; the eastern side, north-westward of Kalambayang harbour, is not so steep, and there is good anchorage about 2 miles off, in 20 or 30 fathoms; but it is also exposed to south-easterly winds.

Aspect.—On the western side of the bay the Sawah mountains extend the whole way parallel with the shore at a distance of about 3 miles, and terminates in Tanjong Rada. On the eastern side Keizer-spiek or Mt. Tangkamus is over the head, and rises to 7,480 feet; Mt. Pesawaran, also 7,480 feet; and Mt. Tangka, 3,419 feet, 4 miles north-eastward of Kalambayang harbour.

Tamping bay, 3 miles northward of Tanjong Rada, is an open bight, but has good anchorage ground in depths from 10 to 15 fathoms, one mile off-shore, but exposed to south-easterly winds.

Water, with some difficulty, may be obtained from the shallow rivulets that discharge into the bay.

Tanjong Waringin village (*Lat. 5° 33' S., Long. 104° 32' E.*) lies in the north-west part of Semangka bay, at the mouth of Sungai Semangka, the water of which is good, but boats will find it difficult to enter. The land is low and marshy near the sea. Near Botong point (Tanjong Betung), the southern extremity of the bay near Tanjong Waringin, there is a rocky ledge which projects more than one mile, with 10 fathoms near it.

Anchorage.—The best anchorage is east from the mouth of the rivulet, one mile distant from the shore. Vessels lie here usually without danger from south-easterly winds, which seldom throw a very high swell so far up the bay.

Tabuan island, nearly in the middle of the entrance of Semangka bay, is high and steep to all around beyond a short distance, except its north-west extreme, which is foul to about 3 cables, the only anchorage being on the north-east side in 25 to 30 fathoms, sand, and very near the shore. The anchorage is a very indifferent one in the westerly monsoon.

Water.—There is fresh water on the island, but the high surf renders landing difficult.

Coast.—From Tanjong Waringin, the coast, low, and wooded with high trees, turns to the north-eastward for 6½ miles to Kota Agung (new), which is the chief village of the Semangka district; a reef fringes this part of the coast.

Kota Agung (old) lies 2 miles eastward of Kota Agung (new), and the coast here is fringed by a reef which always breaks.

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Chart 2056, Sunda strait. Var. 0° 15' E.

Breakers reported. — In 1911 breakers were reported in lat. 5° 31' S., long. 104° 35' E.

Anchorage.—Off the village of Kota Agung (new) anchorage may be obtained in 10 fathoms water, over mud, with the village bearing 18° true, 8 cables from the shore.

The anchorage off Kota Agung (old) is in 21 fathoms water, over mud, with that village bearing 18° true, 9 cables from the shore.

Coast.—The whole of the east coast, from this point to Kalam-bayang harbour, 27 miles south-eastward, is low and backed by high land, and generally fringed by a small coral reef. On this coast are the villages of Padang Ratu, Puti, Pertibi, Paku, and Pekon Dalam.

Plan of Kalambayang harbour on 2056.

Kalambayang harbour (Lat. 5° 44' S., Long. 105° 2' E.), on the eastern side of Semangka bay, and about east from the north point of Tabuan island, is small, but safe, and affords good shelter from all winds, with sufficient depths of water for large vessels; there are 13 fathoms in the centre, and 5 to 8 fathoms a cable from shore. It may be easily recognised by the high and rocky Iyu (Hiu) island, a mile to the southward, which can be seen about 15 miles. Half a mile north-westward of Iyu island lies Kelapa island; there is a channel with 25 fathoms water between these islands.

Supplies.—Water may be obtained from a small rivulet in the north-eastern part of the bay, whence there is a road leading to the village, which is situated in a valley, about three-quarters of a mile from the landing-place, and where probably supplies may be obtained.

Directions.—In the north-west monsoon sailing vessels should enter the harbour by the western passage, between Kelapa island and Tanjong Napal, and when the latter bears about 270° true anchor near the eastern beach in 10 fathoms, mud, or anywhere in the harbour, there being no hidden dangers.

In the south-east monsoon steer in between Iyu and Kelapa islands. With a commanding breeze a vessel may pass eastward of Iyu, between it and Vogel or Bird island (Batu Kabu), or between the latter island and the main, but this channel is narrow. Rover rocks, off South point (Tanjong Baru) are easily avoided, as most of them are above water; they must be left to the eastward.

Plan of Kiluang bay on 3611.

Kiluang harbour, 4 miles south-eastward of Kalambayang, also affords safe anchorage. It may be known by Tongkali island, which is visible 12 miles, and lies off the south-east point of the harbour, being separated from the main by a passage, for small vessels, with 16 fathoms.

General charts 2056, 2761, 941a, 1263.

Plan of Kiluang bay on 3611. Var. $0^{\circ} 15' E$.

Kiluang island, small, and not very high, is within Tongkali island, with some rocks at its northern and southern extremities, a large reef to the eastward and a smaller one on its western side. Northward of Kiluang island the depths are 4 and 5 fathoms, and a high swell sometimes breaks there. Eastward of this, there is apparently anchorage in 11 or 12 fathoms, but great caution is necessary in making use of this inner portion, which is little known. The anchorage under Kiluang is preferable.

Water.—Good water may be obtained from the brook in the north-east part of the harbour.

Directions.—Entering the harbour, approach Tongkali, till it bears 90° true, distant 2 or 3 cables, when three groups of black rocks will be seen, the south-westernmost of which bears 339° true from Tongkali. Steer between the island and rocks, southward of Kiluang island, in from 30 to 20 fathoms, for the eastern side of the harbour, which is very high; and when the centre of Kiluang island bears 270° true, good anchorage may be taken in 13 fathoms sheltered from all winds. Sailing vessels may run out with the land wind which blows here from the northward, but it is recommended to have a boat in attendance to tow, lest they should get becalmed under the high land. Although the bay outside Kiluang harbour is spacious, it is advisable to pass close westward of Tongkali.

Chart 2056, Sunda strait.

Coast.—From Kiluang harbour the coast takes an easterly direction for 8 miles to Tanjong Tikus, the western entrance of Lampong bay. Tuju islets, half a mile from shore, are 2 miles eastward of Tongkali island, and there are other rocks nearer the coast.

Batu Belantung (*Lat. $5^{\circ} 49' S.$, Long. $105^{\circ} 11' E.$*), a rock whereon the sea generally breaks, is three-quarters of a mile south-west of the south point of Peper bay, and a quarter of a mile from shore; it is connected, by an uneven ridge, with the rocky islet northward. Southward of the rock the water is deep.

Peper bay, westward of Tanjong Tikus, is about three-quarters of a mile across; there is a large three-pointed rock in the middle, with a small island westward. Eastward of the rock there is anchorage in 18 fathoms, near the shore.

LAGUNDI ISLANDS, in the south-west part of the entrance to Lampong bay, and between 2 and 10 miles eastward of Tanjong Tikus, consist of seven islands, viz., Lagundi, Rond, Saka, Sunchal, Mangoman, Sasarat, and Tims; all are wooded and uninhabited. Along the southern shore there are 40 to 50 fathoms close to, and near Tims island 27 fathoms. In the western monsoon, the sea breaks

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 20' E.

with great violence on the south side of the islands; on the north side there is landing everywhere, and the depths near the land are 15 to 20 fathoms, clay.

Lagundi, the largest of the group, is $4\frac{1}{2}$ miles long by 2 miles wide, 1,122 feet high, and, except on the south side, is surrounded by a narrow reef. Southward of the west point are two high round rocks, overgrown with verdure, with a passage between for small vessels; also on the south-east side of the island there is a similar rocky islet.

Nangga bay, on the north side of Lagundi island, is small but safe, with 9 to 15 fathoms, clay bottom.

In the middle of the entrance is the little island of Patapan, surrounded by a coral reef which extends north-eastward nearly $1\frac{1}{2}$ cables, behind which a small vessel may find shelter from wind and sea.

Mangoman island (*Lat. 5° 48' S., Long. 105° 17' E.*) is half a mile north of, and is higher and larger than, Patapan; on the north-east side is a reef, with stones always dry, and there is shallow water off the south-west point. The depths around are 10 to 22 fathoms.

Dangers.—A reef, with one fathom of water over it, lies 4 cables 349° true from Patapan island, and shows discoloured water. Nearly one cable north of this is a depth of $2\frac{1}{2}$ fathoms, and 2 cables south, $3\frac{1}{2}$ fathoms, with deep water close to them.

Directions.—The safest passage into the harbour is northward and eastward of Mangoman island, between the coast reefs on either side, with a depth of 16 fathoms.

Water.—In the southern part of the harbour, a small rivulet of good water runs through a grassy flat.

Rond, Saka, and Sunchal islands.—Rond island (Umang), eastward of Lagundi, is 3 miles long in a north-west direction, and one mile broad. Saka (Lagundi Saka), nearly half a mile south-west of Rond, is high and steep; south-eastward of the island, three-quarters of a mile is a rock covered at high water, but always shown by breakers. Sunchal, off the south-east point of Rond, is low on the north side, and except along the south shore, is surrounded by a reef. Views at page 56.

Channels.—In the narrow part of the channel between Lagundi and Rond, the depths are 9 to 14 fathoms, hard bottom; midway is a high round rock named Tua, which is joined to the Lagundi shore. None of the channels between these islands are desirable, the bottom is foul, and the streams rapid.

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 20' E.

Tims island, $2\frac{1}{2}$ miles east of Sunchal, is small and low, with patches of vegetation, and is composed of red rock. A reef, with heavy breakers, surrounds the island, but there are 25 to 30 fathoms between it and Sunchal.

LAGUNDI STRAIT, between Tanjong Tikus and Lagundi islands, is 2 miles wide, and recommended to ships working out of Lampong bay in the westerly monsoon. In the middle of the strait is the high island of Sasarat, with 25 to 30 fathoms around; on the north-east side is a small reef, and off the south-west end lie some high rocks. The passages on either side of Sasarat are equally good, and, with contrary winds or current, there is anchorage on the east side of the island in 10 or 12 fathoms, sand. Vessels drifting through the strait in a calm, will be carried past the island by the off-set of the current.

Medusa reef (*Lat. 5° 47' S., Long. 105° 16' E.*), 100 yards in diameter, with 2 fathoms water and 13 fathoms around, lies a mile northward of Mangoman island; the water over is not discoloured. When the passage between Lagundi and Rond island is open, a vessel will be north-eastward of the reef; and the highest point of Lagundi in line with the west point of the harbour leads well south-westward.

LAMPONG BAY, formed between Tanjong Tikus on the west and Tanjong Kelapa on the east, is about 23 miles wide, and extends nearly the same distance in a northerly direction. Several islands lie along the western shore of the bay, forming sheltered anchorages between them and the main. In the entrance will be found about 20 fathoms, clay bottom, and within, from 10 to 15 fathoms, mud.

The eastern side of the bay, between Telok Betung and Chondong islands, is high, free from danger, and has 10 to 14 fathoms, close to. From Chondong islands to Tanjong Kelapa the coast, at 2 or 3 cables distance, is fronted by a line of rocks, on which the surf breaks heavily with westerly winds, and renders landing difficult.

Pedada bay, the first bight to the northward of Tanjong Tikus, is $1\frac{1}{2}$ miles wide at entrance, and $3\frac{1}{2}$ miles deep.

When running into this bay in the direction of Mount Tangka, the depths will be 20 to 15 fathoms, clay and mud, and the three small islands of Balak, Olo, and Lunik will be seen; Balak is the easternmost and highest.

Dangers.—The bay is fringed by a small coral reef, and two rocks lie north-westward of the south point.

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 20' E.

About half a mile to the northward of Balak island are two detached reefs, which usually break. In the northern part of the bay a large reef lies at a distance of about three-quarters of a mile, 260° true, from its northern entrance point, with a small one, 293° true, about the same distance from it and near the coast.

Anchorage.—Steering in between these two reefs on each side of the bay, anchorage may be obtained in 15 fathoms water near Pedada village, with the west point of Balak island bearing 181° true.

Pedada village is to the westward of Lunik island, and stands on a clear freshwater stream.

Kelapa (*Lat. 5° 44' S., Long. 105° 14' E.*).—The high rocky islet of Kelapa is connected with Tanjong Pedada by three groups of rocks above water, leaving, however, between each of them a passage for small vessels. North-eastward of Kelapa lie also three patches of rock, with 16 fathoms, clay, between them and Setenga (Lalanga Lunik); to avoid them keep Setenga island to the westward of 0° true. This small island is also high, with a reef extending about 2 cables from its north-east point.

Pundu bay, 4 miles northward of Pedada bay, is 2 miles wide and 3 miles deep, with 10 to 7 fathoms water. Across the entrance lies Puhawang, the largest island in Lampong bay, with a peak on its northern side and surrounded by a coral reef, projecting 2 to 4 cables; eastward of it is Little Puhawang, which is enclosed by Puhawang reef.

Shoals in the bay and approaches:—A large reef lies 35° true 2 miles from Little Puhawang island, with 12 to 17 fathoms around, and which may be passed on either side.

A reef of black rocks lies 5 cables 170° true from the south-east point of Kalagian island.

Three reefs, nearly in line, extending 220° true from Tanjong Badung.

Two small reefs near the head of the bay (all these reefs dry at low water).

A bank of 2 fathoms lies 4 cables 57° true from Tanjong Pundu.

Anchorage.—A convenient anchorage will be found, in 7 or 8 fathoms, mud, with the village bearing 271° true, and Tanjong Pundu 136° true.

Directions.—Of the passages on either side of Puhawang island the northern is to be preferred, and approaching from southward, avoid the reef of Puhawang, which extends off 3 cables with 15 fathoms close-to, steer between Puhawang and Kalagian islands, for Tanjong Badung, and between reefs by the chart, then for the village Pundu at the head of the bay.

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 20' E.

Entering south of Puhawang, the islet of Setenga must be kept bearing southward of 136° true, until within half a mile of Puhawang island, to avoid the coral reefs extending half a mile from the south point of the passage; thence keep at that distance from the south shore of Puhawang, in not less than 9 fathoms. Discoloured water on the 2-fathoms bank north-east of Tanjong Pundu will generally be seen, and when the point bears 224° true the anchorage may be steered for.

Ratai bay, just north of Pundu bay, is 3 miles in extent, with 8 to 13 fathoms, mud bottom; Sabu, Ratai, and Pinjindangan villages are situated near the head of the bay, and Menango (Menanga) village on the north side.

A broad mudbank occupies the head of the bay, extending about half a mile off-shore, and three streams enter the western part of the bay.

Kalagian island, which is 394 feet high, lies across the entrance to Ratai bay, about one mile northward of Puhawang island, and is surrounded by a coral reef, which extends about a cable from the north side. On the south side there is a small island separated from it by a boat channel.

Dangers. — North-westward of Kalagian island are two coral reefs, which lie in a N.N.W. and S.S.E. direction from one another; the southern reef has a rock above water, and they both dry at low water. Between the reefs and the island there are depths of from 10 to 11 fathoms.

Directions.—The bay may be entered on either side of Kalagian island; the northern channel is free from danger, but in the southern the sandbank and reefs southward of Kalagian island, the reef near Tanjong Badung, and the reefs north-westward of Kalagian island, must be avoided.

Mahitam island (*Lat. 5° 36' S., Long. 105° 15' E.*) is off the north point of Ratai bay, with which it is connected by a reef. There is a good anchorage on its north side, in 13 fathoms, mud.

Tegal island, flat-topped, 385 feet high, and conspicuous, is north-east $1\frac{1}{2}$ miles, from Mahitam, and $3\frac{1}{2}$ miles west of Chondong islands; it is about a mile in diameter, and surrounded by a small coral reef. Between Tegal and the western shore some sandbanks obstruct the passage, leaving but a small channel, with 15 fathoms, mud.

Tegal island, with its flat top, is visible throughout the whole of Lampong bay. Coming from the eastward, a vessel may steer for it and pass in 15 fathoms; entering from the southward it is also a useful mark from Lagundi strait.

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 20' E.

Ringang bay, north-westward of Tegal island, is about $1\frac{1}{2}$ miles deep, with depths of 9 to 12 fathoms, mud. Off the south point is the islet of Lahu, encircled by the coast reef which here projects northward 3 cables; this reef skirts the whole bay, and off the north point encloses the islet of Tabikel. In the bay are the villages of Ringang, Horun, and Lampasing, the first on a small stream with a reef off its mouth.

Plan of Telok Betung on 940.

Tankil island is 3 miles north of Tegal. Its north side is low, but the south is high; and from the eastern point a stony reef stretches off 3 cables, showing at low water, and may be passed in from 9 to 14 fathoms. On the west side of the island is a passage with 9 fathoms.

Binnen bay, the head of Lampong bay northward of Tankil island, is 4 miles broad and about the same in depth. In the western part, which for nearly $1\frac{1}{2}$ miles from shore is encumbered with reefs and sandbanks, are three islands, Kubur, Pamagotang, and Pasarang.

Kubur, 336° true, $1\frac{4}{10}$ miles from Tankil island, is one cable across, with reefs, partly dry at low water, extending 2 cables east, and 4 cables south-east and south. Between Kubur and Tankil a bank dries out from the shore nearly 4 cables.

Pamagotang (*Lat. $5^\circ 29' S.$, Long. $105^\circ 16' E.$*), the easternmost island, nearly 2 miles 356° true from the east point of Tankil, is 100 yards long, low, with some trees. The islet is surrounded by a reef which extends more than 2 cables west and south and dries in places; there is also a detached reef, with 9 feet water, 159° true 4 cables from the islet, with a narrow passage of 8 fathoms between.

Pasarang is also a low island, 8 cables 339° true from Pamagotang, and 3 cables from the land. On the south-east and south sides the reef runs off 2 cables; eastward of this is a reef which dries, and beyond in the same direction are two detached banks, of three-quarters and half a fathom least water; the outer edge of the latter is 6 cables, 101° true, from the south point of Pasarang.

Nearly midway between the last reefs and Pamagotang is an extensive bank 3 cables long, which partly dries.

In the north part of the bay southward of Apen hill, there is foul ground with rocky heads for 3 cables from shore.

TELOK BETUNG, on the north-west side of the bay, is the chief town and seat of Government for the Lampong district, comprising the south portion of Sumatra and off-lying islands in Sunda strait.

The southern limit of the roadstead is the line through the south point of Pamagotang island and the south point of Sungai Panjang.

General charts 2056, 2761, 941a, 1263.

Plan of Telok Betung on 940. Var. 0° 20' E.

The beach off the town is flat with dry mudbanks; southward where it extends off to Pasarang is coral. Small vessels discharge at the stone jetty.

LIGHTS (*Lat. 5° 27' S., Long. 105° 16' E.*).—A white flashing light every three seconds, showing a flash of one second duration, is exhibited, at an elevation of 48 feet above high water, from a white iron frame 46 feet in height, situated 440 yards eastward of the new pier, and 65 yards from the shore. It is visible from a distance of 12 miles.

An occulting white light, every four seconds, showing light, two seconds, eclipse, two seconds, is exhibited, at an elevation of 59 feet above high water, from a white framework beacon, situated on the easternmost reef off Pasarang island. It is visible from a distance of 12 miles.

Mails.—Telegraph.—There is a mail steamer fortnightly to Batavia, and telegraphic communication.

Tides.—It is high water, full and change, at Telok Betung, at IXh.; springs rise 3 feet. The highest tide is two days after full and change.

Directions.—Passing eastward of Tegal, the east point of the island must be kept bearing westward of 180° true, to avoid the dangers on the west side of the bay, and when past the light-beacon marking the reef off Pasarang, anchor abreast the town with the light bearing 336° true in 7 or 8 fathoms. At night, from midway between Tegal and Chondong islands, steer 348° true, and when the flashing light bears 315° true, haul over for the anchorage.

Sungi Panjang.—The eastern side of Telok Betung, from the head to Chondong islands, is high, with scattered villages, and a steep coral reef lines the shore. This reef may be closely approached, except off Sungi Panjang, where the edge is half a mile from the high land. The small harbour fronting the river, which is shown on chart 940, is not mentioned in the latest Dutch directions.

Light-buoy.—A white light-buoy, exhibiting a white occulting light, is moored on the western side of the entrance to the small harbour fronting the Sungi Panjang.

Chart 2056, Sunda strait.

Chondong islands are three in number, of which the northernmost is a high steep rock, and the two others are larger, but not so high. Between the islands are narrow passages, with 12 fathoms water; and between them and the main the depths are from 10 to 14 fathoms, mud.

Dangers.—From the south point of the eastern island a reef extends for a distance of 4 cables, and half a mile eastward of the

General charts 2056, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 30' E.

south point of the same island there is a small coral reef about one cable square, with one fathom least water on it.

About $1\frac{1}{4}$ miles, 141° true, from the above island is a reef about 4 cables in extent, with a least depth of $1\frac{1}{4}$ fathoms over it.

Coast.—From Chondong islands the coast trends in a south-easterly direction for 5 miles, to Tanjong Selakie (Selaki), and then 120° true for 8 miles, to Tanjong Belantung; it is high, and fringed by a coral reef about 3 cables in breadth which breaks with westerly winds, and at one mile from the shore are depths of 11 and 12 fathoms.

Kraanvogel or Crane island (*Lat. $5^\circ 40'$ S., Long. $105^\circ 28'$ E.*), 9 miles south-eastward from Chondong islands, and connected to the shore by a coral reef, with 9 fathoms close to its south and west sides, is difficult to discern, as it lies close to the high land, and consists only of a single rock; just to the eastward of it, however, there are some white limestone rocks on the shore.

Lubuk or Belantung bay, eastward of Tanjong Belantung, runs northward $1\frac{1}{4}$ miles, and is nearly 2 miles broad. In the entrance are 10 and 11 fathoms, mud, which decrease to 5 and 4 fathoms; the shore is lined with a stony reef, on which the sea breaks. The villages of Belantung and Lubuk are near the head, the latter on a fresh-water creek.

Kalianda road is 3 miles south-east of Belantung bay, with the village of Kalianda on a small rivulet. Upon the white sandy beach are large rocks above water, with easy landing between them. Hot springs rise amongst the rocks near the village.

Dangers.—A rock, which dries at low water springs, lies about 3 cables from the shore, with the flagstaff bearing 129° true, and there are several rocks in the immediate vicinity with depths of 3 to 5 fathoms between them.

Buoy.—A black conical buoy is moored to the south-westward of these dangers.

Telegraph cable.—A telegraph cable connects Kalianda with Java; vessels are prohibited from anchoring near the cable, which lies in a west-north-west direction from a beacon with triangle near the cable house. A *red fixed* light is exhibited from near the cable house.

Anchorage.—There is good anchorage in 7 fathoms water to the southward of the buoy, with the flagstaff in line with the stone pier-head, bearing 114° true.

The coast from Kalianda runs southward 4 miles, and south-eastward 2 miles further to Tanjong Kelapa. Here and there upon the skirting coral reef are rocks above water, scattered villages will be seen

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. $0^{\circ} 30'$ E.

along the shore, and the slopes of Mount Raja Basa rise steeply from the water. The two peaks of Mount Raja Basa, 3 miles inland, are conspicuous, the north-western is 4,235 feet high, and the south-eastern 3,920 feet. View at page 56.

With westerly winds this coast is dangerous, and there is no landing.

Chanti road is northward of the prominent point 4 miles from Kalianda.

The anchorage is in 8 fathoms, blue mud, with the south point of the road 137° true, and the south-eastern Tiga islet 237° true; the depth decreases regularly to 3 fathoms near the edge of the reef.

Water.—At the village of Chanti there is good water.

Raja Basa road is north-westward of Tanjong Kelapa, and on the shore is the large village of Raja Basa. Water can be obtained, but with greater difficulty than at Chanti.

The anchorage is one mile from shore in 9 fathoms, mud, with Tiga islet 275° true, the village 67° true, and Tanjong Kelapa 123° true.

Tanjong Kelapa (*Lat. $5^{\circ} 50'$ S., Long. $105^{\circ} 37'$ E.*) is low and overgrown with cocoanut trees, but is easily seen; the reef round the point may be approached in 8 or 9 fathoms.

Coast.—From here the coast runs east 4 miles to a slightly projecting point, off which are the small islands Menkodo (Menkudu) and Sekapal, and 2 miles beyond in the same direction the land turns sharply south for 3 miles to Varkenshoek. Menkodo, about 3 cables in length in a north-north-east and south-south-west direction, and one cable in breadth, has two summits about 65 feet high. Sekapal, situated 2 cables from the coast, is highest at its southern part.

Small vessels pass between the islets and main, at high water, and find shelter. With a high sea from south of south-west the only convenient landing-place is northward of the western islet.

This coast was swept by the tidal wave during the last eruption of Krakatoa, and the lower slopes are bare of trees.

Tims or Collier rock, 6 or 7 feet high, 33 yards in extent, and steep-to, lies $1\frac{1}{2}$ miles 312° true from Varkenshoek, and $1\frac{1}{4}$ miles from the nearest land. It can be seen at least 3 miles.

KRAKATOA ISLAND, an active volcano, lying in the middle of Sunda strait, was, before the earthquake in 1883, about 5 miles by 3 miles in extent. That portion of the island northward of the highest peak was completely destroyed by the upheaval, and the scattered fragments form numerous banks in Sebesi channel, which is rendered unnavigable. The island is now about 3 miles in length, east and west,

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 30' E.

by 2 miles in breadth, and from the peak, 2,657 feet high, the north side of the island, is a perpendicular cliff forming part of the arc of the crater, which lies between it and Verlaten island.

Except on the north coast, a steep reef surrounds the shores, and from the west point projects one mile. A mile from the north side the depths are 82 to 157 fathoms, green bottom. Views at page 56.

Tides.—It is high water, full and change, at Krakatoa island, at VIIh. ; springs rise 4 feet, neaps scarcely perceptible. The tides, however, are much influenced by the prevailing monsoon.

VOLCANIC ERUPTION.—The volcano of Krakatoa (*Lat. 6° 9' S., Long. 105° 26' E.*) was in eruption in the year 1680, and although included within the category of active volcanoes it remained in a state of quiescence for upwards of 200 years.

In the year 1883, on May 20th, the volcano burst out with great violence, accompanied by earthquakes, which were severely felt at Batavia, and at the same time vast showers of pumice and ashes were projected to a great distance. The eruption was observed from the Imperial German ship *Elizabeth*, and on the following day, when 100 miles from Krakatoa, a shower of dust was experienced which was estimated to become a layer one inch in thickness in 24 hours, and this was still falling when the vessel had gained a position 300 miles south-west of Sunda strait.

On 26th August of the same year, Krakatoa again burst into eruption, and of such a terrible nature that miles of coast on both sides of the strait were wholly devastated, and multitudes of people perished. On the 27th August, a succession of earthquake waves swept the shores of the strait, utterly destroying the towns of Anjer, Merak, Charingin, and Telok Betung, together with some of the lighthouses on both shores. This remarkable disturbance of the sea made itself felt in various parts of the world upon the same date, notably in Australia and Southern Africa, also at Karachi, in India.

The vast amount of pumice which lay upon the surface of the sea, in some places many feet in thickness, gave an appearance as if the ocean bed had appeared above water.

The steam from the volcano was estimated to have been driven to a height of more than 12 miles, and the rain of ashes fell over all southern Sumatra and northward to Singapore, eastward to Batavia, and south-westward to the Cocos islands; finer particles of dust floating in the upper atmosphere enveloped the earth, and caused brilliant sunsets up to December of that year. The sound of the explosions was heard at Perth in Western Australia, in New Guinea, Ceylon, and the island of Mauritius.

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 30' E.

The tidal wave, which where obstructed increased greatly in volume, was observed at Toppers island to rise 72 feet; at Merak, between the island and mainland, about 120 feet; and from Varkenshoek to Telok Betung the average height was about 80 feet. Every object on the shore, in to the first range of hills, was levelled with the ground, and where the land was low the sea penetrated 5 miles inward. At Telok Betung the water rose to the square of the resident's house, 118 feet above high water; and the Government steamer *Berouw* was swept over the pier into the Chinese quarter of the town, a distance of nearly 2 miles from the anchorage. The undulation was felt on the north coast of Java; in Batavia road it rose 8 feet in height, and, in Tanjong Priok harbour, on August 27th, from 12-30 to 1-30 p.m., the water suddenly fell 18 feet.

The island, for 100 feet up, remained a mass of glowing lava and stones; all animal and vegetable life was destroyed, and it was five years before verdure again returned.

According to official report 36,417 persons perished, 37 of these being Europeans.

Verlaten island, $2\frac{1}{2}$ miles north-west of Krakatoa, is nearly three times larger in area than formerly, and is 673 feet high; it is also an active volcano. The island is about $3\frac{1}{2}$ miles in length, in a north-east and south-west direction, by one mile in breadth. A broad reef, with rocks above water, surrounds the island, and extends northward $1\frac{1}{2}$ miles. One mile eastward of the east point is a bank under water. View at page 56.

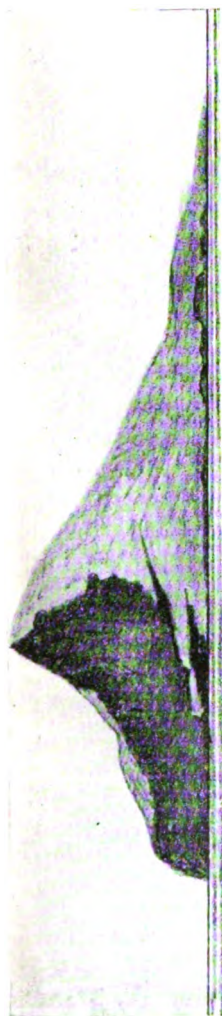
Lang island, 443 feet high, is $1\frac{1}{2}$ miles long, north and south, and about half a mile broad, and separated from the north-east side of Krakatoa by a channel nearly $1\frac{1}{2}$ miles wide. This island does not appear to have altered much, but the channel formerly between it and Krakatoa was only 2 cables wide; a reef stretches out from its west side nearly half a mile. View at page 56.

Dangers.—Three-quarters of a mile west of the south point is Boatswain rock, rising perpendicularly from a great depth to 17 feet above the sea. Two rocks are off the north point, and half a mile northward is a depth of $2\frac{1}{4}$ fathoms.

Krakatoa channel between Krakatoa and Lang island, is about $1\frac{1}{2}$ miles wide, with deep water. As reefs extend from Krakatoa and Verlaten island, great caution is necessary, and the passage should only be used by steam vessels.

Sebesi or Tamarind island (*Lat.* $5^{\circ}57'S.$, *Long.* $105^{\circ}29'E.$), about 11 miles 16° true from Krakatoa peak, is 3 miles across and nearly circular. It has two peaks, which rise abruptly from the

General charts 1653, 2761, 941a, 1263.



Krakatoa, bearing 114° true.

Verlaten island.

Lagundi.



Krakatoa, bearing 310° true, 0 m.

Lang island.

Sebesi.

Sebesi.



Lagundi. Rond island.

Verlaten island.

Krakatoa, bearing 9° true, 21 m.

Mt. Raja Basa.

Volcanoes in Sunda Strait

Chart 2056, Sunda strait. Var. 0° 30' E.

southern extremity of the island, and slope gently down to the northward; the higher is 2,818 feet above high water. About half a mile off the east side are three small islets named Husband, Little Tamarind, and Gorts; each surrounded by a reef, with banks between them; a reef extends about a third of a mile off the north-east side of Sebesi. Views at page 56.

Anchorage.—There is good anchorage around this island except on its south side, in 15 to 25 fathoms water; and at one mile from the north-east side there is an excellent roadstead with 13 fathoms water, even in south-west gales.

Sebesi channel, between Verlaten and Sebesi, is 8 miles wide; it is obstructed by reefs, and banks of mud and pumice, thrown out from Krakatoa, and should not be attempted. The centre of the channel is occupied by an extensive flat, 8 miles long in a north-west and south-east direction; Steers reef on the western part, and Calmeyer reef near the south-east end are nearly awash, and the bank, which is liable to constant change, generally breaks all over. On the southern side of this flat are detached heads of 3 and 4 fathoms; on the north side, between the shoal and Sebesi island, is Hindostan rock with 9 feet water, $1\frac{1}{2}$ miles from the island, and Boom rock a few feet above water, half a mile from shore.

Sea rocks (*Lat. 5° 58' S., Long. 105° 22' E.*), $5\frac{1}{2}$ miles 259° true from the south-west end of Sebesi, are two pyramidal rocks, steep-to, and inaccessible. The southernmost, about 30 feet high, is the largest, and named Gap rock, from a cleft in it. They are connected under water by reefs, upon which the sea continually breaks. The depths round the rocks are from 7 to 14 fathoms, and south-south-east of them, distant about half a mile and $1\frac{1}{4}$ miles, are two patches, with 5 and 4 fathoms water over them, respectively. Other dangers not charted may exist in this neighbourhood.

Sebuku island, 1,398 feet high, lies north-north-east one mile from Sebesi island, and consists mostly of craggy hills. Its extent is $3\frac{1}{2}$ miles north and south, and about 3 miles east and west.

Reefs and ledges project from the numerous points of Sebuku, but they do not seem to extend far off, except from the west point, from which a reef stretches off $1\frac{1}{2}$ miles; this reef is steep-to, but not dangerous because the westernmost rock on it rises to a considerable height above the water, and has a slight resemblance to Sea rocks.

Close to the east side of Sebuku is Beschutter or Shelter islet, which is 460 feet high, and is surrounded by a small reef. A coral rock, lying mid-channel between the east point of Sebuku and north point of Beschutter islet, renders it unadvisable to enter from the northward.

General charts 1653, 2761, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 30' E.

Anchorage.—Between Beschutter islet and Sebuku there is good anchorage for small vessels in 15 to 18 fathoms water, over clay, and there is a good road for large vessels in 11 to 15 fathoms water, over clay, off the east side of Beschutter islet.

The channel between Sebuku and Sebesi islands is one mile wide, with soundings from 16 to 22 fathoms, hard sandy bottom. The passage northward of Sebuku, between it and Tiga islets, is $1\frac{1}{2}$ miles wide, and has from 24 to 30 fathoms.

Tiga islets, or Three Brothers, are small and rocky; they are 7 miles southward of Lubuk bay, and $2\frac{1}{2}$ miles from the nearest point of Sumatra. From eastward they appear as one, and do not begin to open until near Raja Basa road; the western island is largest, and from its north-west side a reef projects $2\frac{1}{2}$ cables, and is generally marked by breakers. Between the two south-easternmost islets is a channel with 18 fathoms.

Plan of Zutphen islands on 3611.

VARKENSHOEK, or HOG POINT (Tanjong Tua) (*Lat. 5° 54' S., Long. 105° 43' E.*), the south-eastern extreme of Sumatra, is high, rocky, and thickly overgrown with trees. Half a cable westward of the point is a rock above water, and the water is deep close to the shore.

The coast from Varkenshoek trends to the north-eastward for 6 miles to Steile huk; Tanjong Bawang, one mile eastward, is precipitous, and the hill behind rises to 390 feet. Two miles north of Varkenshoek the summit of the land is 837 feet above the sea. From Varkenshoek to Tanjong Bawang the shore is rocky and the water deep; beyond this there is fringing reef, and the depths gradually decrease. Midway between Varkenshoek and Steile huk, half a mile inland, is the village of Begantungan, and a small unnavigable river enters the sea half a mile southward.

ZUTPHEN ISLANDS, lying along the coast north-east of Varkenshoek, extend over nearly 5 miles in length by 2 miles in breadth; the south side of the group is steep-to, and the water deep. The four larger islands and three of the smaller are high and densely wooded, the remainder being coral islets, some with scanty vegetation; between them are many reefs. In the western monsoon both the north-west-going and south-east-going streams are felt with some strength amongst the islands.

The passage westward of the group is used by coasting vessels, but for others it is not recommended.

Kandang (*Lat. 5° 54' S., Long. 105° 45' E.*), the south-westernmost of Zutphen islands, nearly 2 miles long, three-quarters of a mile wide, and wooded, consists of two separate hilly portions, the southern

General charts 2056, 1653, 941a, 1263.

Plan of Zutphen islands on 3611. Var. 0° 30' E.

being 320 feet high, and the northern 226 feet. On the east side of the island is a small bordering reef. On the north-west side is a small bay with anchorage for coasters, close in-shore, in 11 or 12 fathoms. A reef projects half a cable from this point of the island.

North-westward of Kandang are two coral reefs, the western, Gosong Tembulung Besar, mid-way between Kandang and Kelapa, is 300 yards long by 75 yards broad; the other, Gosong Tembulung Kechil, of about the same size, is between the first and Kandang. On the north end of each is a dry sandbank. There is deep water between and on either side of these reefs.

Hout and Hoog islands.—Hout (Penjurit), the easternmost and third in size, has on the south side a ridge 300 feet high, and on the eastern point is a hillock of 177 feet. The island is three-quarters of a mile long and half a mile wide; a reef borders the eastern sides. Hoog island (Kandang Kechil) is smaller and 315 feet high. There is a small islet southward of Hoog island named Menjukut. A rapid stream runs between these islands.

Kelapa island (*Lat. 5° 52' S., Long. 105° 45' E.*), on the western side of the channel north-westward of Kandang, is small, low, and surrounded by reefs; between the island and the Sumatra shore is a passage with 16 to 27 fathoms.

Sindo, a rocky islet further south and under the Sumatra coast, has on its south-west part a small hill. It is about 2 cables across, and on the west, south-west, and south-east sides surrounded by a reef, 45 yards broad. On the west side of the islet is a narrow cove about one cable long, with 2 to 3 fathoms water; small vessels can cross the reef at high water.

Anchorage, in 5 fathoms, will be found southward of Sindo, with the south-east point of the island in line with the highest point of Rimau, and the south point of Kandang 123° true, but this is open to swell from southward.

North-westward, and 2 cables northward of Sindo, are reefs which dry; 2 cables east of the latter is a depth of 4 fathoms. Between the islet and the main there are 3 to 6 fathoms water.

Gebroeders, or Pulo Dua, northward of Hoog island, are low and each about 2 cables long. Except on the sides facing each other, they are fringed by a reef 60 to 120 yards broad, with stones above water; between the islands is a passage 100 yards across with 7 to 12 fathoms. A small head, with 4 fathoms water, lies 233° true 2 cables from the western island.

Rimau island, 1½ miles long by one broad, the northernmost and largest of Zutphen islands, is also the highest, and has two

General charts 2056, 1653, 941a, 1263.

Plan of Zutphen islands on 3611. Var. 0° 30' E.

summits 802 and 718 feet high, the south end being the higher. The north-west end is low for 400 yards from the extremity, a portion of which is a sandy beach, affording a good landing place. The island is partly fringed by a reef to the distance of half a cable, with 5 fathoms close-to.

Boompjes reef (Gosong Barak), parallel with the western part of the south coast of Rimau, is 4 cables long and one cable broad; at low water the east and west ends dry, and at high water some stones still show. Between the reef and island is a passage 60 to 80 yards wide, with 10 to 12 fathoms.

Gosong Geni lies 38° true, a quarter of a mile from the north-west point of Rimau; at high water one, and at low water two, sandbanks are dry; it is one cable long north and south, with deep water near.

Gosong Gijang, on the west coast of Rimau, abreast Tumpul, is 2 cables long and partly dry; between it and the island is a passage 150 yards wide, with 8 to 10 fathoms.

Rimau Kechil, a rocky islet 212 feet above high water, and about a cable in diameter, lies close to the north-east point of Rimau, with from 14 to 17 fathoms water in the channel between.

Tumpul island, between Rimau and the main, is a quarter of a mile long, and surrounded by a narrow reef which, from the north point, projects half a cable.

Kramat and **Katila** are two small islets near the shore, southward of Tumpul, both surrounded by narrow reefs. Kramat, the northern, is one cable long.

Panalang and Usumbra are two steep reefs nearly mid-channel, southward of Katila, each having a dry sandbank at its northern end. Between and around these reefs are 7 to 23 fathoms. A drying rock lies 4 cables, 194° true, from Panalang; a reef near the western shore, 3 cables south-westward of Katila; and a sunken rock, 1½ cables north-eastward of that islet.

Steile huk (Tanjong Sumur Batu) (*Lat. 5° 50' S., Long. 105° 46' E.*), on the Sumatra coast, abreast the north point of Rimau, is bluff and steep, the ridge of hills behind attaining the height of 812 feet at Mount Andong. The reef at the point is 80 yards broad, and off the village of Sumur one cable.

Gosong Labuan, a reef partly above water, lies on the shoal bank 4 cables north-north-eastward of Steile huk, and 3 cables east-north-eastward of the point are two patches of 3 and 5 fathoms, respectively, and 8 to 15 fathoms around.

General charts 2056, 1653, 941a, 1263.

Plan of Zutphen islands on 3611. Var. 0° 30' E.

Anchorage.—In the westerly monsoon there is good anchorage northward of Steile huk, in 9 or 10 fathoms, mud and sand, off the rivulet of Sumur, with the coast of Kandang island open west of Rimau. There is considerably less current here than amongst Zutphen islands.

Chart 2056, Sunda strait.

Working through Sunda strait during the North-west monsoon.—The best route is between Zutphen islands and Stroom rocks (pages 41, 42), giving Zutphen islands a berth of $1\frac{1}{2}$ miles, thence work up by short tacks along the coast of Sumatra to Varken-shoek. In working through the passage between Sebuku and Sumatra, pass either northward or southward of Tiga islets, as the strong currents and hard squalls may allow, thence to the northward of Tims island (*Lat. 5° 49' S., Long. 105° 23' E.*), and between it and Sunchal, or through Lagundi strait. In this manner a vessel will make a quick passage through the strait, if the wind be not too variable, besides having the advantage of anchoring on the east side of Sebuku island, or in Lampong bay, if the currents or winds be too strong.

There are, however, on record, many instances of vessels having worked out of the strait along the coast of Java, during the westerly monsoon, with more ease and celerity than could have been effected by stretching into Lampong bay, in consequence of the southerly current from the Java sea having then developed its chief strength along the eastern side of the strait. *See Tides on page 30.*

General charts 1653, 941a, 1263.

CHAPTER IV.

FROM SUNDA STRAIT NORTHWARD, AND TO BATAVIA.

VARIATION IN 1914.—Decreasing about two minutes annually.

Chart 1653, Island of Java, western portion.

This chapter describes the coasts and islands in the northward and westward approaches to Sunda strait and Batavia; the Sumatra coast is first dealt with, then the numerous islands northward of those in the immediate vicinity of the Java coast between Sunda strait and Batavia, and lastly the coast of Java from Sunda strait to Krawang point.

MONSOONS.—In the western part of the Java sea, except within the influence of the east coast of Sumatra (*see* page 73), the south-easterly monsoon prevails from April to November, and it is generally hazy, with overcast nights. The north-westerly monsoon lasts from December to March, and is stronger in force than the south-easterly. Thunderstorms also are more frequent than in the eastern parts.

In April feeble winds are experienced near the Java shore, mostly land and sea breezes, but in May the monsoon blows steadily from east-south-east. During November southerly and light variable winds return; these are felt in the offing, with land and sea breezes on the coast.

The western monsoon begins in December, and reaches its maximum strength in January and February, blowing then from west-north-west, and abates in March. At this season the land breeze seldom comes off the Java coast.

In the eastern part of the sea during April, there are light southerly breezes, but with airs from all directions; the south-east monsoon is at its height in July and August, and blows with much steadiness for seven months, from May to November, between east-south-east and south-east.

The westerly monsoon commences in December and lasts to about the middle of March, the greatest strength being in February, and the direction west-north-west. This monsoon, which in the central part south of Borneo blows from west, here abates in steadiness as well as

General charts 941a, 941b, 1263.

Chart 1653, Island of Java, western portion.

force, but heavy squalls may be looked for, and these occur exclusively with westerly winds.

Owing to particles of dust brought from Australia, it is very hazy during the south-east wind, being densest about September and October, and distant objects are then but dimly seen. In the westerly monsoon, especially in April, when the rainfall decreases, the atmosphere is transparent, with bright starry nights.

Rain.—Showers may fall at any time, but the heaviest rains are expected from November to April in the western part, and in December, January, and February in the eastern, about one wet day in three occurring over the whole area.

Sea.—Considerable swell comes through from the China sea, particularly during the strength of the north-west monsoon, and a heavy sea is frequently experienced, partly attributable to varying currents running in opposition to the wind.

Currents are for the most part drift-streams, depending on the winds; during the south-east monsoon the west-flowing current in the eastern part of the sea is joined, and deflected to the southward by the strong inflow through Makassar strait; southward of Borneo it runs west, and turns north-westward into Carimata strait; also in a lesser degree through Sunda strait.

Similarly, in the north-west monsoon, the current south-eastward through Carimata strait, turns east, south of Borneo, and, when influenced by the southerly stream of Makassar strait, trends more south towards the islands east of Java.

In this monsoon, when passing the large bays or indentations on the north coast of Java, an inset will be found at the western, and an outset at the eastern ends, which may amount to a mile an hour.

The average daily rate during the south-east monsoon is 11 miles, and in the north-west monsoon 15 miles, but they are irregular in force and direction.

TIDES.—Generally, in the western part of the sea, the highest, or spring, tide occurs one day after the moon's greatest declination; from springs to two days before neaps, high water each day is half an hour later; after that it is earlier each day until three days after neaps, the maximum as much as one and a half hours, then lessens to the next spring.

The range at springs, over this area, is from about 3 to 6 feet.

Tidal streams, except in narrow passages near the land, are only felt during the still periods between the changes of monsoons; at other times they merely accelerate or retard the wind currents.

General charts 941a, 941b, 1263.

Chart 2056, Sunda strait. Var. 0° 40' E.

The COAST of SUMATRA from Steile huk runs in a northerly direction for about 150 miles to Banka strait; for 25 miles of this distance there are few dangers outside the coast bank, but beyond, reefs and shoals stretch off many miles from shore, the land being generally low, flat, swampy, and uninhabited.

From Steile huk to Tanjong Kanganan, a distance of 3 miles, the shore is low, sandy, and overgrown; nearly a mile northward of Steile huk is the village and rivulet of Sumur, and Sumur hill, 344 feet high, is the northern end of the coast hills extending from Varkenshoek. The shore reef runs off half a mile and the 5-fathoms line is close to the edge of shoal water.

About 2 miles westward of Tanjong Kanganan are Guchi and Taman, two hills 820 and 827 feet high; the former appears as a broad, truncated cone, the latter is also broad, with its highest point on the south side; thence northward the country is densely wooded, and flat as far as Sungi Nibung.

Tanjong Kanganan (*Lat. 5° 48' S., Long. 105° 48' E.*).—**Reefs.**—A coral reef $2\frac{1}{2}$ cables in extent, with a least depth of $2\frac{1}{2}$ fathoms, lies $2\frac{1}{2}$ cables off Tanjong Kanganan, and about one mile southward of Logok island, with depths of 7 to 13 fathoms close-to. There is a coral patch of 6 fathoms $2\frac{1}{2}$ cables north-east of this reef, and one of $2\frac{1}{2}$ fathoms three-quarters of a mile south of the point, and the same distance off-shore.

Logok (Kapia) is a small but high island covered with vegetation, one mile north of Tanjong Kanganan, a cable within the edge of the 3-fathoms line of soundings, and half a mile off-shore.

The Gezusters (Sisters) are three small low islands off Tanjong Chukunanga, about $2\frac{1}{2}$ miles northward from Logok. The northernmost is the largest, about 2 cables in extent, the western half is covered with cocoanut trees, the eastern side is a swamp; the other two are covered with low trees and bushes, and not readily distinguished from any distance. The western island is $2\frac{1}{2}$ cables from the shore, and they all lie within the edge of the 3-fathoms line. Irregular ground extends eastward, with patches of $5\frac{1}{2}$ fathoms one mile east, a depth of 9 fathoms 2 miles from the outer island, and a depth of 8 fathoms about $1\frac{1}{4}$ miles eastward of the southern Gezuster.

North island, $3\frac{1}{2}$ miles north of the Gezusters, and 2 miles from shore, is a low coral island, 4 cables in extent, covered with trees and brushwood. It is encircled by a reef extending off in some places a cable. Two conspicuous trees on the north end of the island may be seen from the distance of 14 miles.

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Chart 2056, Sunda strait. Var. 0° 40' E.

Sina, the small islet, one cable southward of North island, is covered with bushes, and there is a channel with depths of 8 to 9 fathoms, between the steep coral reefs fringing Sina and North islands.

Sibrandi reef, a coral patch of $3\frac{1}{2}$ fathoms, with 6 to 8 fathoms close-to, lies with Sina islet bearing 270° true, distant about half a mile, and there is a patch of $5\frac{1}{2}$ fathoms between the reef and North island.

Directions.—Mount Andong open east of Logok islet leads eastward of these patches.

Between North island and the shore bank there is a channel about 3 cables wide with 8 to 16 fathoms water. Vessels taking it should pass about $1\frac{1}{2}$ cables westward of the island; keeping the summit of Rimau island open just eastward of the northern Gezuster, will lead clear of the 5-fathoms edge of the bank.

Anchorage.—Between North and Gezuster islands the coast is edged by a mudbank; at 2 miles from the shore will be found good anchorage, in from 8 to 12 fathoms, mud, with North island bearing 11° true, at about the same distance. Small vessels will find good anchorage between Gezusters islands and the main, in 2 or 3 fathoms water.

In the easterly monsoon, there is considerable sea at times; vessels may then anchor under the lee of North island, in 10 to 16 fathoms, mud and sand. The holding ground is generally good, but the bottom should be ascertained before anchoring, as many isolated patches of coral exist.

From North island to Sungai Sekampung the 5-fathoms line is $1\frac{1}{2}$ miles from shore, and close to the steep shoal edge of the bank.

Sungai Sekampung (*Lat. $5^\circ 35' S.$, Long. $105^\circ 50' E.$*), 6 miles north of North island, is the largest stream of south-east Sumatra; the entrance is about 2 cables wide, and 200 yards a short way within. On the bar at low water is 2 feet, and the rise at springs 3 feet; inside it deepens to 4 and 5 fathoms, and the strength of the stream is $1\frac{1}{2}$ to 2 miles an hour.

From southward the thickly wooded south point of the river is sharply defined, but when abreast, the mouth is difficult to distinguish. In the westerly monsoon boats may conveniently water, but in the easterly monsoon a heavy surf breaks upon the bar.

Anchorage.—There is anchorage $1\frac{1}{2}$ miles off the entrance, in 6 fathoms, with North island 187° true, and the mouth of the river 246° true.

The coast from Sungai Sekampung runs north for 19 miles to Tanjong Penat, and is covered with high trees which may be seen

General charts 1653, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 40' E.

14 miles off. The only streams of any importance are the Nibung and Maringei; the latter is east of Mount Imbung, and at high water can be ascended by small vessels to the flourishing village of Maringei. Northward of the river is a sand beach, while to the south the land is swampy. The coast bank, with coral heads of as little as 3 feet water, is here 2 miles wide, and the 5-fathoms line is 5 miles from shore.

From Tanjong Penat, which is conspicuous only from south, the coast continues north 20 miles to Tanjong Sekopong, and is fronted by shallow banks, extending off the latter point more than 10 miles. Sekopong is a prominent round wooded point; the extreme is a peninsula, half a mile long, covered with high trees.

Nibung hill (*Lat. 5° 26' S., Long. 105° 44' E.*), 16 miles northward of North island, the southernmost of a group of summits within this portion of the coast, is 774 feet high, and somewhat conspicuous from southward. Mount Imbung, 6 miles northward, and 770 feet high, is covered with trees, and is the most prominent, being but 3 miles from the coast. Knobbelsberg, 968 feet, is 8 miles north-westward of Imbung, and has a conspicuous knob on its summit.

Dangers.—A coral patch lies within the 3-fathoms contour line, $1\frac{1}{2}$ miles of the mouth of the Maringei river, with Mount Imbung bearing 281° true, distant 5 miles.

A small rocky reef, about half a cable in diameter, on which the least depth is 3 feet, with $3\frac{1}{4}$ fathoms close-to, lies with Mount Imbung bearing 257° true, distant $5\frac{3}{4}$ miles.

Shahbunder (Shahbandar) bank, nearly midway between Tanjongs Penat and Sekopong, extends from the shore, abreast Segama islands, for 9 miles, to the limit of the 5-fathoms line. Within this line are many ridges of coral and stones, with from $1\frac{1}{2}$ to 2 fathoms water. Coast continued northward in China Sea Directory, Vol. I.

Between Shahbunder bank and Segama, the channel is 6 miles wide with 7 to 9 fathoms.

Segama (Two Brothers), low coral islands, one mile in extent north and south, are 15 miles from the Sumatra shore. The northern islet is small and round, the southern is 4 cables long; both are overgrown with brushwood and tall trees; those on the south islet may be seen 15 miles. Each is encircled by a reef nearly 2 cables wide, and there is a passage between of 5 to 6 fathoms.

There is a rock, with 3 feet water, 3 cables 212° true from the south islet.

General charts 2149, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 40' E.

Swallow bank (Lat. $5^{\circ} 18' S.$, Long. $106^{\circ} 5' E.$), with a least depth of 22 feet, is a round patch of coral, 87 yards across, with 8 to 10 fathoms, mud and sand, close around, and lies with Segama bearing 16° true, distant $7\frac{1}{2}$ miles. Vessels of heavy draught should be careful to give it a wide berth, as except under very favourable circumstances (calm water and with a current of at least one knot), there is no ripple to indicate its position. At one cable 180° true is a patch of 5 fathoms, sand and shells, with 9 fathoms between it and the bank.

Lynn reef is composed of coral, about one cable in extent, with a least depth of 2 feet; from the reef the highest part of the southern of Segama bears 286° true $6\frac{1}{2}$ miles. There are depths of 6 fathoms close to the reef, deepening to 12 fathoms one cable distant. The sea only breaks on the reef with an easterly swell.

The extremes of the Segama islands subtend an angle of 9 degrees at the reef; if therefore they be made, whilst passing on (or within a point or more of) the above bearing to subtend an angle of 8° , a vessel will pass about a mile outside the reef; and if an angle of 10° , half a mile inside. In calm weather the shoal from its dark colour is extremely difficult to see until close upon it; a sharp lookout should always be kept, as the shoal may only be detected by a slight ripple. At night it is recommended to close the Segama islands, and pass them at the distance of from one to 2 miles.

Brouwers reefs are two dangerous coral reefs, about $8\frac{1}{2}$ cables in extent, with a dry patch of sand and coral upon each. Between the two patches there are 10 to 14 fathoms. Hard ground stretches from their north and south ends; at a short distance to the eastward and westward the bottom is soft, and the depths 14 and 15 fathoms.

The northern reef lies with the southern Segama island bearing 241° true, distant 11 miles, and North Watcher island 124° true, 13 miles. They may usually be seen from the distance of 2 miles.

Clearing marks.—Mount Imbung, well open southward of South Segama, leads southward of Brouwers reefs, and the same mount open northward of North Segama leads northward of the reefs.

The highest mountain seen in clear weather to the southward, is Mount Karang (5,833 feet high), south of Anjer, but the round hill, Mount Gedeh, 1,968 feet high, over St. Nicolas point, is more often visible, and is a good landmark.

At night vessels should pass within a prudent distance of North Watcher light.

General charts 2149, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 40' E.

At about 6 miles north-westward of Brouwers reef, with Two Brothers bearing 203° true distant 8 miles, a bank with 6½ fathoms (least water found) was passed over by H.M.S. *Magpie*, 1883.

NORTH WATCHER is 3 cables in length, one cable in breadth, and covered with trees; it is visible in clear weather 14 miles. On the north-west side is a small haven, formed by a breakwater of coral stone, having a flagstaff at the extremity, and affords landing for boats.

The island is surrounded by a coral reef, which dries in places, and extends on the east and south sides a distance of 2½ cables.

LIGHT (*Lat. 5° 12' S., Long. 106° 28' E.*).—From a white iron frame tower, 157 feet high, near the centre of North Watcher island, is shown from a height of 159 feet above high water, a *fixed and flashing white light every minute*, which should be seen in clear weather from a distance of 18 miles. The flash is of *eight seconds* duration.

Omega reef, about 1½ cables in extent, and with a depth of 3 feet, is steep-to, and lies 5½ cables 114° true from North Watcher.

Karang Pajong, a small patch with a depth of 5 feet, is 192° true from the lighthouse, distant 5½ cables. Between the reefs and the island the depths are 14 to 16 fathoms, mud and sand. These reefs will be avoided by keeping the angle of elevation of the light at 2° or less.

Anchorage.—At the distance of about 7 cables from the lighthouse, in all directions, there is good anchorage in 12 to 13 fathoms; nearer the island the depth increases in places.

Arnemuiden bank, 17 miles east of North Watcher, is a coral bank 2 cables across, with a dry bank of gravel near the centre, which is 100 yards long, and visible 4 miles. There are depths of 10 to 15 fathoms close-to, and 11 to 12 beyond.

LIGHT.—A *red flashing light* is exhibited, at an elevation of 33 feet above high water, from a black skeleton beacon 26 feet in height on Arnemuiden bank.

Etna bank, 11 miles 117° true from Arnemuiden bank, is also of coral, 2 cables in extent, with a similar dry bank near its centre. The depths are 14 to 16 fathoms close-to, and 12 fathoms all round, 3 cables off.

LIGHT.—A *white occulting light every four seconds*, thus:—light, *two seconds*; eclipse, *two seconds*, is exhibited, at 44 feet above high water, from a white iron frame lighthouse on the western side of Etna bank, and should be seen from a distance of 12 miles.

THOUSAND ISLANDS are about eighty in number, extending in a north-north-west direction nearly 23 miles. These islands are overgrown, some with high trees visible from a distance of 14 to

General charts 2149, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 40' E.

16 miles. All are surrounded by steep coral reefs, which at low water are partially or entirely uncovered, and in some cases large areas of water are impounded, into which native boats cross at high tide, and find shelter.

Besides the islands there are a large number of reefs with dry banks of sand and stones, here and there having some vegetation; and many submerged rocks and banks of less than 3 fathoms water.

Only three of the islands, near the centre of the group, have any fixed population, viz., Panjang, Kelapa, and Pelemparan. In the village on Panjang are 200 inhabitants, the others together have 500; besides these there are temporary settlements by fishermen.

Separating the various clusters of islands are a number of passages, which cannot be safely used without local knowledge; and between the south side of the group and Hoorn islands is a channel, 2 miles wide, with 18 to 30 fathoms.

Winds are stronger here than under the Java shore, more so in the south-east than north-west monsoon, and land and sea breezes are but little felt. The force of the wind is greater at night, but steadier during the day.

Tides.—There is but one high water and one low water in each 24 hours; about the middle of June it is high water at XIh. p.m., and is two hours earlier each succeeding month. The range in July and December is 2 to 3 feet, and in March and September one to one and a half feet. The annual variation in the mean sea level is only 4 inches.

Tidal streams.—In calms and light winds, the stream sets eastward during the rising and westward during the falling tide, the former being stronger than the latter. The usual strength is not more than one knot; the greatest observed was 2 knots (*see* page 13).

Jason rock (*Lat. 5° 24' S., Long. 106° 16' E.*), a dangerous coral patch in the fairway westward of the Thousand islands, is about 50 yards in extent, with a least depth of 13 feet, and from 16 to 19 fathoms close-to. The water is discoloured immediately around it, but at a short distance its position is only discernible when there is a strong current. It lies with Pebelokan or West island 119° true distant 8½ miles; and North Watcher 41° true.

Arminia rock, composed of coral and stone, circular in shape, and about 55 yards in diameter, with a least depth of 15 feet, and 12 to 16 fathoms, over mud, close around, lies with North Watcher bearing 26° true, and the south extreme of West Dua island 96° true, distant 6½ miles. Under favourable conditions its position is indicated by ripples, but not by discoloration of water.

General charts 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 40' E.

Hereward reef, a coral head, about a cable in extent, of 9 feet water, with 13 to 17 fathoms close around, is 3 miles east of Arminia rock, with North Watcher lighthouse 12° true, 12 miles; and the western Dua island 102° true.

Pebelokan or West island (*Lat. 5° 29' S., Long. 106° 24' E.*), the north-westernmost of the group, is 3 cables long by 2 cables wide, densely wooded, and steep-to at half a cable distant, except off its sandy north-east point, where the encircling reef extends a distance of 2 cables. The tops of the trees are visible 13 miles in clear weather.

Coventry reef, of coral, one mile 204° true from Pebelokan, is 2 cables in extent, dry at low water near its north end, with 5 fathoms on the south end. This reef is marked by discoloured water, breaks with a slight swell, and there are depths of 15 to 17 fathoms all around at the distance of half a cable.

East Dua island, in line with Pebelokan, leads northward, and East Dua, in line with Rangat islet, leads southward of Coventry reef.

Rangat islet is about 200 yards in length, and surrounded by a sandy beach, with a reef extending in places nearly one cable. Brush-wood and a few tall trees are growing on it.

Rangat reefs, about 7 cables in extent, are three detached patches with a least depth of 3 feet, and with deep water between and around them. From their extremes, Rangat islet bears 337° and 292° true, about one mile distant.

Edeling reefs, two small stone banks nearly midway between Rangat and West Dua islets, are 4 cables apart in an easterly direction. The eastern patch, with 4 fathoms least water, lies with Rangat islet bearing 226° true, distant $1\frac{3}{4}$ miles; the western patch has a depth of $4\frac{1}{2}$ fathoms. With a strong current running, their positions are denoted by rippings; both are steep-to with 15 fathoms water at a short distance.

Beronang reef, about one cable in extent, with $1\frac{1}{2}$ fathoms least water, and 14 to 18 fathoms around, lies three-quarters of a mile north-west of the western Edeling reef, with Pebelokan bearing 226° true, distant $3\frac{1}{2}$ miles. It may generally be seen by discoloured water or rippings.

Dua islands, the two northernmost of the Thousand islands, are one mile apart, surrounded by reefs one cable broad, and thickly wooded. The eastern islet is the larger, being 3 cables long by 2 cables wide. Between the islands is a clear channel, with 16 to 18 fathoms.

Baka, a patch of 7 fathoms, lies between the above bearings with Jajung island 51° true, $3\frac{1}{2}$ miles distant.

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Chart 2056, Sunda strait. Var. 0° 40' E.

Indera Puteri (Indra Putri), with a least depth of $1\frac{1}{2}$ fathoms, and nearly 3 cables in extent, lies with the west extreme of Jajung island bearing 136° true, distant one mile.

Channel.—There is a channel about 3 miles wide between Rangat and Edeling reefs on the west, and Indera Puteri reef on the east; to clear these the eastern Dua islet must be kept between the bearings 29° true and 346° true until North-east island bears more than 91° true.

Jajung (Jagung) island, the north-west extreme of the main group, is 4 cables long and one broad, densely wooded, and encircled by a reef to the distance of one cable. Half a mile north of the island is a shoal of $2\frac{1}{2}$ fathoms.

Genting and Sui reefs.—Genting reef, with $3\frac{1}{2}$ fathoms, lies half a mile, 301° true, from Genting Kechil; Sui reef, with 4 fathoms, is $1\frac{1}{2}$ miles from Genting in the same direction; the latter reef is not noticeable from any discoloration of the water.

Northward of these reefs there are no dangers beyond the reefs encircling the islets.

Beronang reefs, two small patches, with a depth of 2 fathoms on the eastern one, lies about $1\frac{1}{4}$ miles northward of Chermee reef, and about the same distance west-south-west of Genting Kechil; the western patch has a depth of 7 fathoms.

Chermee reef, with a depth of 3 fathoms, lies one mile 61° true, from Pilang bank.

Pilang, a reef half a mile long with a dry sandbank on the middle, is one mile 51° true from Mungu rock, with depths of 16 fathoms close around; Ketamba reef, with a least depth of 2 fathoms, lies about midway between.

Mungu rock (*Lat. $5^\circ 41' S.$, Long. $106^\circ 30' E.$*), the westernmost of the reefs lying off the west side of the group, is 3 cables in extent, dry at low water, and marked by breakers or discoloured water at all times. It lies with Kotok Kechil bearing 109° true, distant $2\frac{1}{4}$ miles.

Kotok besar lies $4\frac{1}{4}$ miles north-north-westward of Karang Beras. It is 6 cables in length, covered with trees, with a reef encircling it to the distance of $1\frac{1}{2}$ cables. The trees on Kotok Kechil, half a mile north-westward, may be seen from a considerable distance.

Karang Dalam, a patch of 6 fathoms, lies $1\frac{1}{4}$ miles 107° true from Karang Beras; and Angka shoal, with 8 fathoms water, and 20 fathoms close to, is 281° true, distant 4 miles from Karang Beras.

Ayer and Karang Beras are the southern islets. Ayer is one of the few distinctive islets; it may be known by a tall broad-topped tree on its north extreme, with two cocoa-palms south of it towering

General charts 1653, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 40' E.

above the surrounding vegetation. A sand islet lies on the eastern extreme of the reef, $1\frac{1}{2}$ miles in length, which surrounds it. Karang Beras, covered with trees, is about 2 cables in length, and $2\frac{1}{4}$ miles distant from the Hoorn islands; it is surrounded by a reef which extends from 3 to 7 cables. An isolated patch of $2\frac{1}{2}$ fathoms is $1\frac{1}{2}$ cables off the south-east extreme of the reef.

North-east island (*Lat. 5° 27' S., Long. 106° 34' E.*) (Panchalirang besar), is 4 cables long, overgrown with high trees, and surrounded by a reef 2 cables broad. North-westward 2 cables, is the small islet of Beteloran Kechil.

Panchalirang Kechil, half a mile south-west of North-east island, is also thickly wooded, and rather smaller than North-east island; the surrounding reef is a half to 2 cables wide. Northward 4 cables, is Panchalirang reef, with 2 fathoms water.

Westward 4 cables is the wooded island Beteloran, and south-west of this is Buton, with one broad spreading tree in the centre. Two cables north-west of Buton, is a reef with one fathom; and 2 cables north a depth of 3 fathoms.

Ringit island, nearly 2 miles southward of North-east island, is $3\frac{1}{2}$ cables in length, with a reef extending $1\frac{1}{2}$ cables south-eastward.

Mayang reef, the only known danger on the east side of Thousand islands, beyond the reefs encircling them, is about half a cable in extent, with a least depth of $4\frac{1}{2}$ fathoms; it lies with Ringit island bearing 247° true, distant $1\frac{1}{2}$ miles.

Between Mayang reef and Opak Kechil islet, 12 miles to the southward, all danger will be avoided by giving the islets a berth of one mile.

Between Opak Kechil and Lang island, a distance of 4 miles, are the extensive Chonkak and Simpiti reefs; they dry at low water, and at all times may be seen by breakers or discoloured water. These also should not be approached within one mile.

The bottom is everywhere mud, or sand and mud, and there is good anchorage under the lee of the islands.

Belanda, a small islet slightly eastward of the adjacent islands, is a somewhat prominent object, being covered with tall casuarina trees, resembling a small wood from a distance; a reef extends 2 cables eastward from it. Bira and Genting islands, each about three-quarters of a mile in length, are westward; and Pemadaran, a similar island, with a reef extending one mile eastward, lies to the south-west.

Panjang, Kelapa, and Pelemparan islands, each about 3 cables in length, are the inhabited islands, the two latter are close

General charts 1653, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 40' E.

together; the encircling reef extends nearly one mile eastward and westward of them.

Lang and Sekati islands are the south-easternmost of the group. Lang or Long islet is half a mile in length, with small trees growing on the reef extending 3 cables eastward of it. Sekati is smaller, with a similar reef.

South Watcher (Peniki) (*Lat. 5° 42' S., Long. 106° 43' E.*) is 7 miles eastward of the southern groups of the Thousand islands, and $17\frac{1}{2}$ miles 334° true from Edam island lighthouse in Batavia road. It is small, covered with trees, and surrounded by a reef extending from one to $2\frac{1}{2}$ cables, with depths of 23 fathoms within half a cable of the reef. The island is visible from a distance of about 14 miles, and from a vessel abreast of it the Thousand islands will be seen from aloft.

SUNDA STRAIT TO BANKA STRAIT.—Winds.—

In this part of Java sea the south-east monsoon cannot be depended on before the middle of May, and lasts until October; during this season it may vary between south and north-east.

The weather is dry, with fresh breezes and hazy skies, the haziness being least in the morning hours, but the coast is seldom seen.

In November very variable winds may be expected, but in December the westerly monsoon blows with increasing steadiness; in January the general direction is west-north-west, and in February north-west, after that a retrograde movement sets in with a gradual decrease in steadiness; in March it is west-north-west, and in April west-south-west.

Rain is more plentiful during these months, with heavy squalls which are more frequent at night, and the haziness is less.

During the easterly monsoon the wind is most steady by night, and in the westerly by day.

In both seasons, in daytime the wind will shift to northward as the Sumatra coast is approached and the influence of the sea breeze is felt; and at night it will combine with the land wind, and draw round to south-west or west. These land and sea breezes may sometimes be felt as far eastward as North Watcher.

Tides.—In the middle of June it is high water near Banka strait about XIh. p.m., the low water occurring about 9 hours later; these times are two hours earlier each following month, with the uneven rates of rising and falling observed in the adjacent parts of Java sea. The single day tide prevails, but about neaps a second tide is in slight measure seen. Springs rise, south of Banka strait, 8 feet; at Tanjong Menjangang 7 feet, and neaps 3 feet; off Tanjong Sekopong 4 to 5 feet, and 2 feet.

General charts 1653, 941a, 1263.

Chart 2056, Sunda strait. Var. $0^{\circ} 40'$ E.

The greatest strength of the tidal streams is $1\frac{1}{2}$ knots; generally the streams run south during the falling tide, and north with the rising tide, but as the drift-current in both monsoons trends towards Sunda strait, the total set southward will be greater than northward. Near Tanjong Sekopong (*Lat. $4^{\circ}56'$ S., Long. $105^{\circ}54'$ E.*), during the changes of monsoon, the tidal streams will run northward for 6 hours, and southward 18 hours.

Chart 2149, Banka and Gaspar straits.

DIRECTIONS.—Steam vessels from Sunda strait to Banka strait, proceed northward between Segama and North Watcher islands, avoiding Jason rock by keeping North Watcher lighthouse eastward of 57° true, and when clear of Lynn and Brouwers reefs, a course is taken eastward of Five Fathom banks.

Sailing vessels usually steer direct for Segama, keeping the southern island bearing northward of 11° true to lead eastward of Swallow reef.

Segama islands may be passed on either side, westward of Lynn and Brouwers reefs (*see* page 67); the channel west of the islands is 6 miles wide, but Shahbundar bank must not be approached into less than 7 fathoms water. When northward, these islands must be kept bearing westward of 180° true.

Working north, it will be prudent to keep on the Sumatra side, and when northward of Sibrandi reef (page 65) to tack inshore when North island is in line with Rimau, the highest Zutphen island, in depths of 6 to 8 fathoms.

From northward to Sunda strait.—Steam vessels and sailing vessels with fair wind, after passing eastward of Five Fathom banks, in 10 to 12 fathoms, steer for the passage between Segama and North Watcher. In the eastern monsoon, when the atmosphere is hazy and the coast rarely visible, great care is necessary in passing Segama, which from northward appear as one.

At night.—Vessels from northward should obtain a good position before dark, and steer for North Watcher light; when past the light it must not bear northward of 57° true until beyond Jason rock—which is 2 miles within the limit of visibility of the light—then steer for Sunda strait. With doubtful reckoning at dark, it would be prudent to anchor.

SUNDA STRAIT TO BATAVIA.

Chart 2056, Sunda strait.

Coast.—The coast between Sunda strait and Batavia, is low, and generally swampy, entirely covered by brushwood with higher trees within. Here and there, where the shore is not swampy, are villages with cocoanut and other trees.

General charts 1653, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 40' E.

Sixteen miles south of Bantam bay is Mount Karang (*Lat. 6° 16' S., Long. 106° 3' E.*), with three tops, 5,833 feet high. Thirty miles inland of Batavia are Gedeh mountains, the highest being Mount Pangerango, of 9,918 feet, and Mount Salak, 7,267 feet, is 15 miles westward; these peaks are usually only seen in the western monsoon.

Wind and weather.—On this coast, between Sunda strait and long. 111° E., the westerly monsoon lasts from December to April, being strongest in January and February, with dark showery weather; during daytime the sea breeze adds strength to the wind, and draws it into north-west, but the land wind is seldom felt.

In May the easterly monsoon blows freshly from east-south-east, and is strongest from June to August. Both land and sea breezes prevail at this time.

Between the monsoons calms and squalls of winds from all quarters will be experienced, with rain and thunderstorms, particularly during the autumn change. The rainfall is greatest on the mainland of Java, less on the off-lying islands, and still less in the open sea.

Tides.—There is one high water and one low water in 24 hours, although the second tide is slightly apparent; low water follows about 9 hours after high water. The greatest range is 3 feet. In the eastern monsoon the combined wind and tide streams will run to the westward $1\frac{1}{2}$ to 3 knots; part of it turns into Bantam bay.

BANTAM BAY.—From St. Nicolas point the north coast of Java takes an easterly direction for about 2 miles to Tanjong Piatu, and then turns south-eastward into Bantam bay, which between Tanjongs Kapo and Pontang is 9 miles in width, and 6 miles in depth.

Near the entrance of Bantam bay the depths are from 10 to 12 fathoms, sand, decreasing gradually towards the shore, where the bottom is mud. The southern and eastern sides of the bay are low and marshy; but in the west is Santeri (Santri) hill, 315 feet high, and more to the northward is Mount Gedeh, 1,968 feet high. The little hill of Pinang, known also as Mount Bantam, 853 feet high, situated on the plain westward of Karang Antu, is conspicuous.

Salira and Kali islands.—Between St. Nicolas point and Tanjong Kapo are Salira and the Kali islands, from 2 to 3 cables off-shore. Salira, a low coral islet with a few trees, within the 3-fathoms line, affords shelter for small coasting craft. Also between Kali islands and the shore is a small anchorage in 3 to 4 fathoms.

Islets in Bantam bay.—Panjang island, in the entrance, is about 2 miles in diameter, thickly covered with vegetation with cocoa-palms on the south side, and surrounded on the east, north, and west sides by a coral reef to the distance of 50 yards, and on the south side

General charts 1653, 941a, 1263.

Chart 2056, Sunda strait. Var. $0^{\circ} 40'$ E.

250 yards, with a detached reef, of one foot water, off the south-west point. On its south-east side the reef extends to the distance of half a mile, and here there are two islets; Mount Gedeh, open south of Panjang islet, leads southward; and the east point of Panjang, bearing 337° true, leads eastward of the reef.

Pamujan besar and Pamujan kechil islands lie, respectively, 3 miles eastward, and 2 miles south-eastward of Panjang island, nearly in the middle of the bay. These are encircled by coral reefs to the distance of half a cable, beyond which there is no danger. The islands are small, thickly wooded, and on each is a conspicuous tall tree. Several other islets lie on the west and southern sides of the bay, within the depth of 3 fathoms, the outermost is Kubur, 2 miles from the coast in the south-west part of the bay.

Panjang is the only inhabited island in Bantam bay; the village is on the south side.

Tanjong Pontang (*Lat. $5^{\circ} 56'$ S., Long. $106^{\circ} 16'$ E.*), the eastern extreme of Bantam bay, is formed by the delta of Kawala Pontang, and is covered with tall trees. The river has three entrances, almost dry at low water, and though deeper inside can only be entered by very small craft or boats. A mudbank of less than 3 fathoms extends one mile northward of the point, and continues round Bantam bay from one to $1\frac{1}{2}$ miles off-shore. In rounding the point the depths should not be shoaled to less than 12 fathoms until the east point of Babi island bears 341° true.

Karang Antu (Bantam), situated on the river eastward of Old Bantam, is the port of Serang, the capital of the Residency of Bantam. Old Bantam was formerly the native emporium of these seas, but is now an insignificant place. Serang, distant about 6 miles, is in connection with the telegraph service, and on the main road and railway to Batavia. A harbour master is stationed at Serang, and a harbour sloop at Karang Antu.

The salt and coffee warehouses are at the village one mile up the river.

Supplies.—Provisions in small quantities can be procured; any large supplies may be obtained from Batavia. Good water is scarce.

Anchorage.—Small vessels anchor in from $3\frac{1}{4}$ to $3\frac{1}{2}$ fathoms, with Santeri hill in line with the south side of Lima islands; the east point of Panjang island, 1° true; and the small white house, situated close to the river, 192° to 203° true; from one to $1\frac{1}{4}$ miles off the river entrance. Large vessels must not anchor with Lima-Kelapa island bearing northward of 271° true.

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Chart 2056, Sunda strait. Var. 0° 40' E.

Directions.—In approaching Bantam bay, the Pamujan islets may be passed on either side, but the channel westward of them is preferable, having regular depths of about 5 fathoms.

The approach to Karang Antu is from north-eastward of the small harbour light, which is hoisted on a tripod. The entrance is nearly dry at low water, and is only available for boats.

BABI ISLAND is low and about $7\frac{1}{2}$ miles northward of Tanjong Pontang. It is $2\frac{1}{2}$ miles in length, by one mile in breadth, covered with trees, and fringed with a reef extending about 2 cables off its east and west extremes, and from a half to one cable off the north and south sides. Around the island the depths are from 16 to 28 fathoms. A few fishermen occasionally resort to the island, and the best landing is on the south side.

LIGHT (*Lat. 5° 49' S., Long. 106° 16' E.*).—From a white iron framework, 64 feet in height, on the south side of Babi island, is exhibited, at an elevation of 60 feet above high water, an *occulting white light every fifteen seconds*, thus:—light, *ten seconds*; eclipse, *five seconds*; and visible in clear weather from a distance of 13 miles. The keeper's dwelling is white, with red roof. For limits of visibility see Chart and Light list.

Coast.—Eastward of Tanjong Pontang the coast, which is low and covered with trees, trends east-south-east for about 15 miles, thence turning north-eastward to Tanjong Kaik. In the bay thus formed are the villages of Lontar, Pasir-Panjang, Tanara, and Mauk. The two first mentioned may be recognised from the offing by cocoanut palms, which are seen long before the other trees on the coast. Tanara may be known by the red roofs of the warehouses, with a flagstaff, which can be seen above the trees; also known by a conspicuous group of trees, just eastward; the trees are a good mark for leading to the anchorage. Mauk may also be known by some tall trees, which are seen from a considerable distance, and were formerly called False Menscheneter island.

Mudbank.—From one mile off Tanjong Pontang, the mudbank within a depth of 3 fathoms takes an east-by-south direction; off Lontar, its outer edge is 2 miles from the shore. Near Pasir Panjang the distance is again reduced to one mile, whence it suddenly stretches directly off the coast fronting Tanara, for a distance of 3 miles; from this position it passes half a mile northward of Changkir island, and about $1\frac{1}{2}$ miles off the coast. Towards Tanjong Kaik the bank nears the shore, so that off Toasia small craft can approach close-to. In places this bank appears to be extending, and there is as little as $3\frac{1}{4}$ fathoms

General charts 1653, 941a, 1263.

Chart 2056, Sunda strait. Var. 0° 40' E.

2 miles north-east of Tanjong Pontang, with Pamujan besar island 255° true, and the west extreme of Babi 337° true.

Changkir island (*Lat. 6° 2' S., Long. 106° 26' E.*) can be recognised by its dark trees standing out in relief against the coast. A reef extends nearly 2 cables eastward of it.

Dangers.—Off Pasir Panjang is a reef of small extent, with a depth of one foot over it; it lies 31° true, distant about 1½ miles from the entrance to Sungi Pasir.

Two reefs, both of which dry at low water, lie 12° and 23° true, distant 4 and 8 cables, respectively, from Changkir island.

Tanara is a place of some importance situated about one mile inland on the Sungi Chidurian, which forms the boundary between the Residencies of Batavia and Bantam. The depth in the river as far as Tanara is from 2 to 3 fathoms; but the bar at the entrance has barely one foot at low water. The channel is usually marked by fishing stakes, but Mount Karang (Bantam peak) kept in line with the mouth of the river leads in the best water.

Anchorage.—The conspicuous trees eastward of the mouth of Sungi Chidurian (which may be seen from about 9 miles off-shore), kept between the bearings 202° and 226° true, leads between the mud-bank off Tanara and the shoals northward of Changkir islet, to the anchorage, in from 2 to 4 fathoms.

Chart 933, Batavia roads.

Coast.—From Tanjong Kaik the coast trends in an easterly direction to Tanjong Untung Java, a distance of 9 miles, thence turning south-eastward into Batavia road.

Between these points the coast is low and marshy, with some high trees in the background. Near the shore are the villages of Serang, Keramat (Kramat), and Pasir, the positions of which will be seen by the cocoa-palms growing around them. At Tanjong Burung, the Sungi Chisadane enters the sea by several mouths, forming a delta. The bank of hard mud and sand, which fronts the coast of the bight, extends off about one mile; off Keramat are several shallow patches on this bank, which break in bad weather.

WESTERN APPROACHES TO BATAVIA.

GENERAL REMARKS.—Batavia road is approached from the westward by Inner or Dutch channel, or by Outer channel; both may, with ordinary caution, be considered safe. Inner channel is the shorter and is generally used; vessels can anchor in any portion of it, whilst Outer channel is much deeper. Working in, Outer channel is

General charts 2056, 1653, 941a, 1263.

Chart 933, Batavia roads. Var. 0° 30' E.

to be preferred. At night, Inner channel should not be attempted, but the channel close southward of Payung island light should be taken (*see* Directions, page 94).

Buoys and beacons.—These fairways are marked by beacon buoys; white buoys and beacons with balls mark the starboard side of the channel from seaward, black buoys with cones the port side; middle grounds, which may be passed on either side, are marked by red buoys with balls; and dangers outside fairways are marked by buoys with black and white bands.

As other shoals may exist in these channels, caution should be used when navigating them.

INNER or DUTCH CHANNEL.—Islets and reefs on southern side.—**Menscheneter reef** is a bank of hard sand and mud, with patches of stones on which the sea breaks at times, extending $3\frac{1}{2}$ miles northward of Tanjong Kaik, and with an extreme breadth of 3 miles.

Tenga, a small patch of $1\frac{1}{2}$ feet, on the eastern edge, lies 2 miles north-eastward of Tanjong Kaik. Between Tenga and the main reef are several rocks which nearly dry.

Buoy.—A white conical buoy, surmounted by a white ball, with the word “ Menscheneter ” in black letters, is moored off the end of the reef in 5 fathoms water.

Menscheneter (Laki) island, nearly half a mile in diameter, is low, covered with brushwood and tall trees, and uninhabited; it is visible about 12 miles, and begins to be seen when the east point of Babi island bears 0° true. The surrounding reef is from 40 to 240 yards broad, and there is a narrow channel between it and Menscheneter reef.

Anchorage.—South-west of the island there is good anchorage during the easterly monsoon.

Karang di Tenga (*Lat. 6° 0' S., Long. 106° 35' E.*), with a least depth of $1\frac{1}{2}$ fathoms near its western edge, is 8 cables in extent in an east and west direction. The shallow spot lies $2\frac{1}{2}$ miles east-north-eastward of Tanjong Kaik.

Buoy.—A white conical buoy, surmounted by a ball, marks its north extreme.

Untung Java reef extends $1\frac{1}{2}$ miles north-north-eastward of Tanjong Untung Java, and is a continuation of the mudbanks fringing the shore on either side of it. Near its extreme are patches of sand and stones which dry at low water.

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Chart 933, Batavia roads. Var. 0° 30' E.

Buoy.—A white conical buoy, surmounted by a ball, in 5 fathoms, marks the north extreme of the reef, which is steep-to, there being 8 fathoms just beyond the buoy.

The following islets and dangers form the north side of Inner channel, and separate it from Outer channel:—

Struisvogel rocks (*Lat. 5° 53' S., Long. 106° 28' E.*), the western of these dangers, form a group of six coral patches, covering a space of about one mile in extent in a north and south direction. The least depth is 2 fathoms, with from 12 to 20 fathoms between and around them.

Buoys.—A white conical buoy, with ball topmark, marks the north edge of Purak, the northern patch showing the south side of Outer channel; and a black can buoy with truncated cone is on the south side of Karang besar, the southern patch, marking the north side of Inner channel.

Karang Laut, two patches with depths of $3\frac{1}{2}$ and $4\frac{3}{4}$ fathoms over them, together about $1\frac{1}{2}$ cables in extent, are about $2\frac{1}{4}$ miles 88° true from Karang besar.

Tongara is a small coral patch of 3 fathoms, and steep-to, lying 132° true, distant $1\frac{3}{4}$ miles from Karang Laut. Tenga, a small coral patch of 8 fathoms in Outer channel, is 69° true, distant 2 miles from Tongara reef.

Buoy.—A red conical buoy, with ball topmark, marks the southern side of Tongara reef.

Pedynab reef is about $1\frac{1}{2}$ cables in extent, with a least depth of 4 feet, and steep-to. It lies with the west extreme of Great Kombuis bearing 71° true, distant about 8 cables.

Buoy.—A black can buoy, with truncated cone, is moored on its western side.

Great Kombuis (Lanchang) are two low islands, covered with bushes and low trees, those on the eastern being highest with two tops conspicuous above the others. The western island is nearly three-quarters of a mile in length, the eastern less than half a mile; they are 2 cables apart, and the surrounding reef extends north-eastward 4 cables, and in other directions one or 2 cables. On the north-east edge trees are growing on some dry patches. View on chart 933.

Broken ground with shallow heads projects from the western island nearly to Pedynab reef; Chikara, of $2\frac{1}{2}$ fathoms, is 2 cables off the north-east side of Kombuis reef; and there are other places with 4 fathoms, south-eastward.

General charts 2056, 1653, 941a, 1263.

Chart 933, Batavia roads. Var. 0° 30' E.

Little Kombuis (Bokor), nearly 2 miles eastward of Great Kombuis, and 4 cables long, is low with high trees, and surrounded by a reef from a half to one cable wide.

Hordyk and Karang Tiga.—Southward of Kombuis islands are several small coral patches. Hordyk, of $2\frac{1}{4}$ fathoms, the western of these, lies about one mile 131° true from the eastern island of Great Kombuis. Karang Tiga, of $3\frac{1}{2}$ fathoms, is about $1\frac{1}{2}$ miles 125° true from Hordyk.

Buoys.—Both reefs are marked on the south side by black can buoys with truncated cones.

Lumbang, of $1\frac{3}{4}$ fathoms, between Hordyk and Karang Tiga, is about 8 cables south-westward of Little Kombuis. At 3 cables northward of Lumbang there is a patch of 3 fathoms. Pari patches of $4\frac{1}{4}$ and $4\frac{1}{2}$ fathoms, are north-eastward of Karang Tiga.

Meinderts shoal (Gosong Pulo Bokor), of $1\frac{3}{4}$ fathoms, is $1\frac{1}{2}$ cables in extent, and lies midway between Karang Tiga and Middelburg island.

Buoy.—It is marked by a black can buoy with truncated cone on the south side.

Ketapang, a small patch of $2\frac{3}{4}$ fathoms, lies 126° true about one mile from Meinderts shoal. Sonko reef, of $4\frac{1}{4}$ fathoms, is 2 cables 206° true from Ketapang.

Buoy.—A black can buoy, with “Ketapang” in white letters on it, and surmounted by a truncated cone, is moored on the south-east side of Ketapang reef.

Clearing mark.—The beacon south of Middelburg island in line with a conspicuous notch in the trees on Amsterdam island, on the bearing 81° true, leads southward of Sonko.

Middelburg island (Rambut) (*Lat. $5^\circ 58'S.$, Long. $106^\circ 42'E.$*) is low, uninhabited, covered with tall trees, and encircled by a coral reef, one to 2 cables wide.

The reefs stretching one mile westward of Middelburg island are numerous, and the chart will afford more information than a written description of what may be considered unnavigable waters.

Buoy and beacon.—A black can buoy, with truncated cone, is moored on the southern side of the reef extending from Middelburg island, and a wooden beacon, with triangle, is erected about 20 yards within the south-east end of the reef.

Between the black buoy on the south-west edge of the reef and the white buoy off Untong Java reef, Inner channel is but 3 cables in breadth. This is the turning point into Batavia road.

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Chart 933, Batavia roads. Var. 0° 30' E.

OUTER CHANNEL.—Islets and dangers on south side.—The dangers on the south side of Outer channel, as far eastward as Little Kombuis, are those described as forming the north side of Inner channel; the description of the south side dangers are continued from that island eastward.

Lekapo (*Lat. 5° 56' S., Long. 106° 40' E.*) is the north-west patch of a group of isolated reefs covering a space of about 2 miles square, lying north-westward of Middelburg island. It is about 80 yards across, with $2\frac{3}{4}$ fathoms water, and is 2 miles from Little Kombuis, with the north points of that island and Menscheneter in line 263° true.

Buoy.—A white conical buoy, surmounted by a ball, is moored on the western side.

Sau, on the south side of the channel, is $1\frac{1}{4}$ miles north-east of Lekapo, and $2\frac{1}{2}$ miles 349° true from Middelburg island; the reef is half a cable in extent, with 4 fathoms water, and about $1\frac{1}{3}$ cables to the north-westward of it is a depth of 3 fathoms.

Buoy.—A white conical buoy, with ball topmark, is moored on the north side of the 4-fathoms patch.

Eastward of the line joining Sau and Lekapo are Kotak and Bubara reefs, with 3 and $2\frac{1}{2}$ fathoms water. Ujong and Selatan each of $4\frac{1}{2}$ fathoms, are 3 and $3\frac{1}{2}$ cables north of Sau. South-east and south to Middelburg island the ground is foul with many shoal heads; Makiam, of 7 fathoms, the easternmost, is $1\frac{1}{2}$ miles 119° true from Sau.

Dapur, $3\frac{1}{2}$ miles north-east of Middelburg island, is narrow, one cable in length, and covered with bushes, amongst which is a tall tree. The surrounding reef is about one cable broad. Tanda is a small coral patch with 2 fathoms of water, $1\frac{1}{2}$ cables eastward of the island.

The Gosongs are three detached reefs, 3 cables in extent, with a least depth of one fathom, lying about 4 cables north-eastward of Dapur.

Buoy.—A white conical buoy, with ball topmark, marks the north-east side.

The continuation of Outer channel, eastward of Sau reefs, is northward of Dapur island and of this buoy, the passage westward of Dapur island being named Middle channel.

MIDDLE GROUNDS.—Outer channel, between Kombuis islands and the Agenieten islands is divided into two branches; the southern is along the north side of Kombuis island and Lekapo and Sau reef, and the northern close southward of the Agenieten islands.

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Chart 933, Batavia roads. Var. 0° 30' E.

Between these channels isolated reefs extend 4 miles in an east and west direction, 2 miles north and south, and may be termed the Middle grounds.

Delima (*Lat. 5° 53' S., Long. 106° 37' E.*), at the western extreme of this group, is half a cable in extent, with a depth of $2\frac{1}{2}$ fathoms, and 18 to 20 fathoms close-to.

Buoy.—A red conical buoy, with ball topmark, marks the north side.

Jantur and Tandul.—Jantur, with a depth of $4\frac{3}{4}$ fathoms, lies at the south-west corner of the Middle grounds. Tandul, with $3\frac{1}{2}$ fathoms, is nearly 3 cables eastward of Jantur.

Buoy.—A black can buoy, surmounted by a truncated cone, is moored on the southern side of Tandul reef.

Panjang di Laut, the northern shoal of the Middle ground, is 2 cables in extent, with a least depth of 2 fathoms, and lies 71° true, $1\frac{1}{2}$ miles from Delima reef, with the west point of Kongsi island open of the west end of Pari.

Buoy.—A white conical buoy, with ball topmark, marks the north extreme of Panjang di Laut.

Menjumbang, $1\frac{1}{2}$ miles 56° true from Tandul, with a depth of $3\frac{1}{2}$ fathoms, is the easternmost of the buoyed patches. Southward of Menjumbang, and extending into Outer channel, is Seluku with $6\frac{1}{2}$ fathoms, Baju with $4\frac{1}{2}$ fathoms, and Mortuti with $4\frac{1}{2}$ fathoms; these should be avoided by heavy-draught vessels.

Buoy.—A red conical buoy, with ball topmark, marks the eastern side of Menjumbang reef.

This last buoy, with the red buoys on Delima and Panjang di Laut, form the south side of the northern branch of Outer channel; and the two red buoys with the black buoy on Tandul mark the north side of the southern branch of Outer channel.

This completes the circuit of the Middle ground; several isolated reefs lie within this area, the principal of which are Serasa, Panjang, and Pederangan, all of which are guarded by the buoys marking the reefs described.

THE HOORN ISLANDS, 11 miles east of Babi island, and 9 miles 350° true from Menscheneter, are three in number, named Payung, and Great and Little Tidung islands. View on chart 933.

Great and Little Tidung islands.—These islands stand on a narrow coral reef, 4 miles in length in an east and west direction, and steep-to; Great Tidung is about 2 miles in length, and Little Tidung one mile; neither are more than one cable in breadth. The

General charts 2056, 1653, 941a, 1263.

Chart 933, Batavia roads. Var. 0° 30' E.

tops of the cocoanut trees are visible from a distance of 10 miles. The point of the reef extending eastward of the islands has a dry patch near its extreme, and bushes are growing on the northern portion of the reef; westward of the island reef are isolated patches. A few fishermen live on the islands, and on the larger is a well of water.

Karbau shoal.—Westward of Great Tidung island the bottom is foul in places for a distance of $2\frac{1}{2}$ miles. Karbau shoal appears to be the western danger; it is about 2 cables in extent, with a depth of $1\frac{3}{4}$ fathoms, 9 to 12 fathoms close-to, and rapidly increasing to 20 fathoms. From the shoal the west point of Great Tidung bears 115° true.

Sepilah reef, with a depth of one fathom, lies 107° true, distant 6 cables from Karbau shoal.

Karang Selatan, with $2\frac{1}{2}$ fathoms, is 134° true, distant 7 cables, from Sepilah reef, and with the west point of Great Tidung bearing 107° true, distant $1\frac{1}{4}$ miles. Other shoal heads lie between Selatan and Great Tidung. All these reefs are steep-to, and should be given a wide berth.

Clearing mark.—Payung well open to the southward of the south side of Great Tidung, leads to the southward of Karang Selatan.

Payung, probably so named on account of the umbrella-shaped trees growing on it, lies about $1\frac{1}{2}$ miles south-eastward of Little Tidung. It is about 6 cables in length, thickly covered with vegetation, and uninhabited. A shallow reef, which is steep-to, encircles the island, extending 4 cables eastward, 3 cables westward, and about $1\frac{1}{2}$ cables northward and southward; bushes are growing on the dry spots. At the distance of 3 cables northward of Payung, and $1\frac{1}{2}$ cables from the edge of Payung reef, is a narrow reef nearly one mile in length. Brushwood is growing on the dry portion.

LIGHTS (*Lat. $5^\circ 49' S.$, Long. $106^\circ 33' E.$*).—From a white iron framework, 65 feet in height, on the south extreme of Payung island, is exhibited, at an elevation of 61 feet above high water, a *white flashing* light, showing a flash of *one second*, with an eclipse of *two seconds*; visible in clear weather from a distance of 13 miles, except where intercepted by islands.

On the south extreme of Payung island reef, a *fixed white* light, visible 6 miles, is exhibited from a screw pile structure, situated about $1\frac{1}{4}$ cables, 175° true, from the main light. These lights in line, 355° true, lead clear west of Agenieten islands reef.

AGENIETEN ISLANDS are on the north side of Outer channel, about 4 miles northward of Great Kombuis. The group con-

General charts 2056, 1653, 941a, 1263.

Chart 933, Batavia roads. Var. 0° 30' E.

sists of five low islands, entirely surrounded by a coral reef which is 4 miles long in an east and west direction, and nearly 2 miles broad. The edge of this reef is steep-to and nearly dry, and may be distinguished by the discolouration of the water; the weather side of the reef always breaks. At about 2 cables within the edge are narrow ridges of dry coral, which on the north-eastern side have trees and bushes growing on them.

Pari (*Lat. 5° 52' S., Long. 106° 37' E.*), the largest and most eastern of the group, is $1\frac{1}{2}$ miles in length. It is thickly wooded, and inhabited by a few fishermen, whose village may be recognised by the cocoanut trees. The other islets, named **Kongsi**, **Kampung**, **Burung**, and **Tikus**, are thickly wooded, but small, and lie on the reef, westward of **Pari**. Westward of **Tikus** is a patch of coral with brush-wood growing on it, not far from the western extreme of the main reef.

Jong, half a mile eastward of **Agenieten** islands reef, is $1\frac{1}{2}$ cables in extent, with a patch of coral sand always above water, which may usually be seen at the distance of 2 miles. The edge of the reef is steep-to, with depths of 20 to 25 fathoms around it.

A reef of 3 fathoms, one cable in extent, is east-north-east one cable from **Jong** reef, with depths of 20 fathoms around.

Buoy.—A black can buoy, surmounted by a truncated cone, is on the south-east side of this 3-fathoms reef.

Currents, in the western channels to Batavia, are chiefly caused by, and run with, the monsoons, the tidal streams being weak; the greatest strength, about 2 miles an hour, will be found between **Middelburg** island and **Untung Java** reef.

NOTE.—This completes the description of the islands and dangers in the western approaches to Batavia, directions for which will follow the description of **Batavia** bay and road, page 93.

BATAVIA ROADS are between **Tanjong Untung Java**, on the west, and **Tanjong Krawang** on the east, a distance of about 20 miles, and about 9 miles in depth from north to south, between **Edam** island and **Batavia**. In the bay are several islets covered with trees and encircled by reefs, and many shoals, the most dangerous being marked by buoys. The depths decrease gradually from 14 or 15 fathoms near **Edam** island, to 3 fathoms at about one mile from the shore; the bottom is mud, mixed with sand near the reefs, and also the shore.

The shore of the bay fronting **Batavia** is a muddy marsh from one to $1\frac{1}{2}$ miles in width, extending many miles, and interspersed with shallow streams, some of which have been converted into canals navigable for boats. Southward of the sea coast marshes, for 5 or 6 miles

General charts 2056, 1653, 941a, 1263.

Chart 933, Batavia roads. Var. $0^{\circ} 30'$ E.

east and west of the town, are low-lying lands, rice fields, native gardens, &c., intersected by canals.

ISLETS and REEFS.—Middelburg island, and the islets and dangers westward of it, have been described with the Inner and Outer channels (*see* page 81). The dangers, eastward of Middelburg island, will next be dealt with.

Shore bank.—From the buoy marking the north extreme of Untung Java reef, south side of Inner channel, the mudbank within a depth of 3 fathoms, fronting the shore, trends south-eastward, gradually narrowing until abreast Onrust, where it is distant about 4 cables; thence it increases its distance to about three-quarters of a mile from the shore towards Batavia and the harbour at Tanjong Priok.

Amsterdam island (Untung Java) (*Lat. $5^{\circ} 59'$ S., Long. $106^{\circ} 42'$ E.*), on the north side of Inner channel, is separated from Middelburg island by a passage $1\frac{1}{2}$ cables in breadth between the projecting reefs, with 7 to 9 fathoms, and a patch of $3\frac{1}{4}$ fathoms near the centre.

The island is low, covered with trees, inhabited by a few fishermen, and, except on the south side, surrounded by a reef, which in places extends to the distance of $1\frac{1}{2}$ cables. A small landing pier has been constructed at the south-east point.

Schiedam island (Ubi Kechil) is small, about one cable in extent. The reef around extends northwards and eastwards one cable, but on the west side for only a short distance.

Rotterdam island (Ubi Besar) is 2 cables in length, and covered with trees; a coral reef surrounds the island and extends in places to the distance of one cable, with 9 to 10 fathoms close-to.

Ubi rock, with a depth of $1\frac{1}{2}$ fathoms, lies 91° true, distant $2\frac{3}{4}$ cables from the east point of Rotterdam island.

Buoy.—On its north-east side is a white conical buoy with staff and ball, marking the west side of Middle channel.

A reef, about $2\frac{1}{2}$ cables in extent, with a least depth of $1\frac{1}{2}$ feet, is about 3 cables 154° true of Rotterdam island; and 2 fathoms 3 cables 110° true from the south point of the island. Detached patches are close off its east and west extremes. A similar cluster of rocks with $1\frac{1}{2}$ fathoms least water, and steep-to, lies nearly midway between Rotterdam and Kerkhof islands, with the former bearing 324° true, and the latter 199° true.

There is also a depth of $2\frac{3}{4}$ fathoms with Kerkhof island, bearing 171° true, distant $5\frac{1}{2}$ cables.

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Chart 933, Batavia roads. Var. 0° 30' E.

Kerkhof island (Kelor) (*Lat. 6° 2' S., Long. 106° 45' E.*), $1\frac{1}{2}$ miles southward of Rotterdam, is about one cable in extent, and covered with trees. The island stands on the western edge of a reef which extends nearly 2 cables northward and eastward of it. A patch of 3 fathoms lies 241° true, about 3 cables from the middle of the west side of the islet, and a small head of one fathom nearly 3 cables, 179° true, of the north-west extreme.

Tengnagel, a rock of small extent, with 3 fathoms water, and 7 fathoms close-to, is one mile 359° true from Onrust island, with Kerkhof island bearing 129° true.

De Steen (Pulo Kelor), a small coral reef of $2\frac{1}{2}$ fathoms, and 5 fathoms, mud, around, lies with the north-west point of Onrust island bearing 147° true, about 4 cables. Between De Steen and Kerkhof island are several isolated rocks. A 3-fathom patch lies $2\frac{1}{2}$ cables northward of De Steen.

Buoy.—A black can buoy, surmounted by a truncated cone, is moored off the south side of De Steen.

Mathilde rock (Karang Perut), a small patch of one fathom, $4\frac{1}{2}$ cables 277° true from De Steen rock, and nearly 2 cables off the edge of the shore mudbank.

Onrust island (Pulo Kapal) on the western side of the bay, is about 400 yards in extent; on the north and east sides a reef extends one cable, but the south and south-west sides are clear. A shoal of $3\frac{1}{2}$ fathoms lies $4\frac{1}{2}$ cables, 268° true, from the north extreme of Onrust.

Kuiper island (Chipir) is a small island close southward of Onrust, it has a long mole extending from its north side in the direction of that island. A reef extends from its eastern side to the distance of 2 cables, and from the west side beyond the mole, for about one cable; the south-west point is clear.

Close off the edge of the reef extending eastward of Kuiper island is a patch of one fathom.

Buoys and beacon.—A black beacon, with triangular top-mark, marks the west side of the reef off Kuiper island, but south-westward of it for a short distance there is but 3 fathoms of water.

A black can buoy is moored in 3 fathoms water on the eastern edge of the shoal water extending off Benteng, to the westward of Kuiper island. A black can buoy, surmounted by a truncated cone, is moored in $4\frac{1}{2}$ fathoms south-eastward of Kuiper island, and a white conical buoy, surmounted by a ball, is moored in 5 fathoms 3 cables southward of the island.

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Chart 933, Batavia roads. Var. $0^{\circ} 30'$ E.

Jambatan, a small patch of $2\frac{3}{4}$ fathoms, with about 4 fathoms around, lies 201° true, distant $4\frac{1}{2}$ cables from Kuiper island.

Reigersdaal shoal of 2 fathoms, with 5 and 6 fathoms, close-to, lies $1\frac{1}{2}$ miles, 138° true, from the south end of Kuiper reef.

Buoy.—Its north-east side is marked by a white buoy with staff and ball.

Purmerend island (Sakit), is about 2 cables across, and covered with tall trees. This island, except at its south-west point, is encircled by a reef, which on the east side extends to the distance of 2 cables; at half a cable eastward of the reef is an isolated patch of 4 feet.

Purmerend shoal (Pulu Sakit), with a least depth of 1 fathom, is nearly 3 cables in length, and lies with the south point of Purmerend island, bearing 326° true, distant 4 cables.

Buoys.—A conical buoy, with black and white bands, and staff and ball, lies north-eastward of a patch of $1\frac{1}{4}$ fathoms, off the north-east side of Purmerend shoal, and a black can buoy, surmounted by a truncated cone, on the south-western end of the shoal.

Purmerend bank (Jalan), is 2 cables in diameter, with a least depth of $1\frac{1}{2}$ feet, and 6 to 9 fathoms close-to. It lies nearly in the fairway of Middle channel, with the centre of Purmerend island bearing nearly 270° true, and distant $1\frac{3}{4}$ miles.

Buoys.—A black can buoy, surmounted by a truncated cone, marks the south-west side of Purmerend bank, and a white buoy, with staff and ball, its north-east side.

Haarlem island (Ayer Kechil), on the northern side of the Middle channel, lies $1\frac{1}{2}$ miles north-eastward of Rotterdam island, is $1\frac{1}{2}$ cables in extent, covered with trees, and encircled by a reef, which is steep-to, extending (as is the case with all these islands, farthest from the east side) to about one cable. A patch of $3\frac{1}{2}$ fathoms is 2 cables north-east of the island.

Monnikendam reef is about 2 cables in extent, and steep-to, with a patch of sand which dries at low water. It lies with the centre of Haarlem island, bearing 281° true, distant one mile.

Buoy.—A white buoy, with staff and ball, is on the north-east side.

Hoorn island (Ayer Besar) (*Lat. $6^{\circ} 0'$ S., Long. $106^{\circ} 47'$ E.*) is about $1\frac{1}{2}$ miles south-east of Haarlem island. Hoorn island is about 3 cables in length, and covered with tall trees. It stands on a reef which, on the north-east side, extends to the distance of nearly one cable, with 10 to 11 fathoms close-to. The south point of the island is clear.

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Chart 933, Batavia roads. Var. 0° 30' E.

Ayer rock, of 6 feet, is 276° true, distant 3½ cables from the north-west point of Hoorn island.

Buoy.—A black can buoy, surmounted by a truncated cone, is moored on the west side of Ayer rock.

NORTHERN APPROACH.—**Edam island (Damar Besar)**, the largest island in the bay, is between the outer channel route from the westward, and the approach to Batavia from northward and eastward. It is about 3½ cables in diameter, covered with tall trees, and encircled by a reef, which on the north and east sides extends to the distance of one cable; near the edge of the reef are depths of 14 to 20 fathoms.

LIGHT (*Lat. 5° 57' S., Long. 106° 50' E.*). — From an iron tower with a white stone dwellinghouse, 190 feet high, on the west point of Edam island, is exhibited, at an elevation of 182 feet above high water, a *flashing white light*, showing a flash of *five seconds* duration *every half minute*, which is visible in clear weather from a distance of 19 miles.

Edam reef, about 2 cables in diameter, and with a sandbank, dry at low water on its southern part, is steep-to, with 16 to 18 fathoms at a short distance. The sandbank lies with Edam lighthouse bearing 187° true, distant 6 cables.

Buoy.—A buoy, coloured in black and white bands, with staff and ball, is on the north side of the reef.

Karang Keroya or Nassau reef, about 1¼ cables in extent, with a depth of 1¾ fathoms, and from 15 to 17 fathoms, mud and shells, around, is with Edam lighthouse, bearing 170° true, distant 8¾ miles, and Dapur island 218° true. The reef is marked by discoloured water which at times may be visible half a mile.

Clearing mark.—The whole of Alkmaar island, open eastward of Edam island, leads eastward of Karang Keroya, and also of the reefs about to be mentioned. Alkmaar, open westward of Edam island, leads westward of Karang Keroya, but near Jawiel reef.

Reefs.—The following small coral patches are southward and westward of Karang Keroya, but with the exception of Jawiel reef may scarcely be considered dangers; they are all steep-to, with depths of 15 to 20 fathoms at a short distance.

Jawiel reef, half a cable in extent, with a depth of 3¾ fathoms, lies 194° true, distant 1½ miles nearly from Karang Keroya. **Jolo reef**, with 7 fathoms water, is 3½ cables westward of Jawiel.

Duku, two patches, of 9 and 10 fathoms, are about 2 miles westward of Karang Keroya.

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Karang Babur, of 7 fathoms, is $2\frac{3}{4}$ miles 259° true from Karang Keroya.

Karang Jana, of 7 fathoms, 261° true, $6\frac{1}{4}$ miles from Karang Keroya.

Karang Susuh, of 9 fathoms, with Edam island lighthouse bearing 186° true, distant $3\frac{3}{4}$ miles.

Karang Telewiwi, a patch of 11 fathoms, lies 3 cables north-eastward of Karang Susuh.

Alkmaar (Damar Kechil), $1\frac{1}{2}$ miles southward of Edam island, is about 260 yards in length, covered with trees, and encircled by a reef which on its north-east side extends to the distance of one cable, with a depth of 13 fathoms close-to.

Enkhuizen (Nyamuk Kechil) is similar to Alkmaar; the encircling reef extends about $1\frac{1}{4}$ cables northward, with about 11 fathoms close-to.

Leiden (Nyamuk Besar), $1\frac{1}{2}$ miles south-eastward of Enkhuizen, is about 450 yards in length, covered with bushes, and the reef extends one cable to the south-westward, and $2\frac{1}{2}$ cables eastward of it. On the eastern part of the reef is a sandbank which dries. A rock of $1\frac{1}{2}$ fathoms (Amstel shoal) lies just southward of the east point of the reef. Near the edge of the reef the depths are from 10 to 11 fathoms.

Neptunus reef (Pasir) is nearly 3 cables in extent, with a least depth of $1\frac{1}{2}$ feet, and lies $2\frac{1}{2}$ miles south-westward of Leiden.

Buoys.—A black can buoy, surmounted by a truncated cone, marks the north-west extreme, and a buoy with black and white horizontal stripes, and staff and ball, marks the south-east extreme of Neptunus reef.

Rynlands reef (Tahan) (*Lat. $6^{\circ} 5'$ S., Long. $106^{\circ} 48'$ E.*), is the westernmost of the several isolated shoals fronting the shore between Batavia and Tanjong Priok, and forming the northern limit of Old road anchorage, with depths of about 7 fathoms around. It is a small coral patch of $2\frac{1}{2}$ fathoms, and lies $1\frac{1}{2}$ miles south-westward of Neptunus reef.

Buoy.—There is a red buoy, with staff and ball, on the north-east side of the reef.

Pipa reef, a small patch of $2\frac{1}{2}$ fathoms, lies one mile 95° true from Rynlands shoal.

Buoy.—A black can buoy, surmounted by a truncated cone, is on the west side of Pipa reef.

Pasop (Karang Tengelim) is a small patch of 2 fathoms, 13° true, distant 2 cables from Pipa reef.

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Buoy.—A black can buoy, surmounted by a truncated cone, marks its north side.

Neerstuk shoal, which is usually marked by breakers, is about $2\frac{1}{2}$ cables in extent, with a least depth of $1\frac{1}{2}$ feet; its centre lies 103° true, distant nearly one mile from Pasop.

Buoys.—Buoys with black and white bands, and staff and ball, mark the north and south extremes of the reef.

Vader Smit shoal (Putri) is a coral reef $2\frac{1}{2}$ cables in diameter, with its middle portion always above water. It lies about $1\frac{1}{2}$ miles 71° true of Neerstuk, and $1\frac{1}{4}$ miles 295° true from the entrance to Tanjong Priok harbour. Two patches of 7 feet and 11 feet lie about $2\frac{1}{2}$ cables to the north-westward of Vader Smit shoal.

Buoys.—The north-east and south sides of Vader Smit shoal are marked by buoys with black and white bands, and staff and ball.

Van Dorth shoal is a small patch of $2\frac{3}{4}$ fathoms, about one mile eastward of Vader Smit shoal, and 8 cables 330° true from the entrance to Tanjong Priok harbour.

Light-buoy.—Its north-east side is marked by a light-buoy exhibiting a *white fixed* light.

Telegraaf reef, with a depth of $2\frac{1}{4}$ fathoms over it, is situated $6\frac{1}{2}$ cables to the south-eastward of Vader Smit shoal.

Buoy.—A spherical buoy, with red and black bands, and surmounted by a cross, is moored on the eastern side of the reef.

Priok rocks are five patches of coral, from half a mile to about one mile westward of Tanjong Priok harbour, between the depths of 3 and 5 fathoms. The outer patches have from $2\frac{1}{2}$ to 3 fathoms, and the inner from $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms. There are several rocky places off the shore within the depth of 3 fathoms.

Buoys.—A light-buoy, showing a *white fixed* light, is temporarily moored half a mile, 60° true, from Tanjong Priok east pierhead, and a black conical buoy $6\frac{1}{2}$ cables eastward of the pierhead.

Brunda (*Lat. $6^\circ 4' S.$, Long. $106^\circ 55' E.$*) is a small coral reef of $3\frac{1}{2}$ fathoms, 73° true, distant $2\frac{1}{2}$ miles from the entrance to Tanjong Priok harbour.

Buoy.—A black can buoy, surmounted by a truncated cone, marks the south side of Brunda reef.

St. Nicolas shoal, of $4\frac{1}{2}$ fathoms, is half a mile, 330° true, from Brunda reef, with a depth of 7 fathoms around it. Eastward of this reef the bay is clear of dangers, seaward of the 5 fathoms line.

Coast.—From Tanjong Priok harbour the low shore runs in an east-by-north direction for 8 miles and then turns abruptly to the northward for 8 miles to Tanjong Krawang.

BATAVIA OLD ROAD is southward of the line joining the red buoy on Rynlands reef, and the black buoy of Neptunus reef, and

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Chart 933, Batavia roads. Var. 0° 30' E.

between the bearings of Rynlands buoy 10° true, and Neptunus buoy 348° true. The usual anchorage, is 5 to 6 fathoms, mud, is about one mile from the canal entrance. Although, in the western monsoon, much sea comes in and vessels roll considerably, the holding ground is good, and there is little danger of dragging. It is not usual to moor, and as the anchors sink deeply into the soft bottom, they should be occasionally lifted.

When the state of the sea, at the canal pierheads, renders it unsafe for boats and lighters to pass in or out, a blue flag is flown on the look-out at Batavia.

Boats should not be allowed to remain in the canal longer than absolutely necessary, for the swampy nature of the shore, and the mud dredged up in the river emit effluvia, which often produce fever of an infectious type.

BATAVIA NEW ROAD, northward of Tanjong Priok harbour, is bounded east and west by lines running 179° true from the buoys on Brunda, and Vader Smit shoal, and northward by lines 292° true from Brunda, and 66° true from Vader Smit shoal. The anchorage is in 5½ to 7 fathoms; good holding ground of mud.

LIGHTS (*Lat. 6° 6' S., Long. 106° 48' E.*).—An *occulting white light every twenty seconds*, thus:—light, *ten seconds*, eclipse, *ten seconds*, and visible from a distance of 13 miles, is exhibited, at an elevation of 57 feet above high water, from a stone tower with red roof 62 feet in height, situated at a distance of 770 yards within the west pierhead of Batavia canal.

On the outer extreme of this pier is exhibited, from a wooden post, a *fixed white light* visible 2 miles.

From a white iron frame on the head of the western breakwater of Tanjong Priok harbour is exhibited a *fixed white light*, at an elevation of 42 feet, and visible from a distance of 11 miles.

From a similar frame on the head of the eastern breakwater is exhibited an *occulting white light every six-tenths of a second*, showing eclipses of *three-tenths of a second*, and visible from a distance of 8 miles.

Tides.—During the two seasons of the monsoons, there is only one high and one low water in the 24 hours. In the middle of June it is high water about Xh. p.m., and low water about Xh. a.m., and being earlier each succeeding month, in December these conditions are reversed, and it is low water about Xh. p.m., and high water about Xh. a.m.

In these two months occur the highest and lowest tides of the year, the spring range being 3¼ feet. The greatest rise registered is 4 feet, and the least one foot.

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Chart 933, Batavia roads. Var. 0° 30' E.

In August a second tide begins to appear, and about 20th September there are two tides of nearly equal range; before this date the evening tide is higher than the morning, afterwards the morning tide is the greater.

In like manner, in the early months of the year the second tide gradually shows, and the two are equal in March; the morning tide being greater before, and the evening tide after, the time of equal range.

At the island of Edam (*Lat. 5° 58' S., Long. 106° 51' E.*), it is high water half an hour earlier than in Batavia roads (*see page 13*).

DIRECTIONS.—Inner or Dutch channel.—By day.

—Having rounded St. Nicolas point, distant about 2 miles, a course about 99° true will lead to the entrance of Inner channel—usually taken by steamers and sailing vessels with a fair wind—southward of Struisvogel rocks, Kombuis and Middelburg islands. In clear weather, and under favourable circumstances, the reefs with a less depth than 3 fathoms will be seen by the discolouration of the water, and along the coast fishing stakes in many places extend out to depths of 4 or 5 fathoms and occasionally into the channels.

From abreast Babi island the high trees just eastward of Tanara will be seen, and soon afterwards Kombuis and Menscheneter islands, the tall tree on Tanjong Kaik, and Mauk wood, known as False Menscheneter, will come in sight. Struisvogel rocks separate Inner from Outer channel, and the black buoy marking the southern rock must be left on the port hand; in mid-channel abreast the buoy the depth is from 10 to 12 fathoms, mud, deepening towards the rocks. Thence to Middelburg island the course is about 106° true, northward of the white buoy on Menscheneter reef, and southward of all the black buoys, the depth decreasing to 10 and 9 fathoms.

Abreast Middelburg island, the channel between the black buoy and beacon marking the island reef, and the white buoy on Untung Java reef, which is steep-to, is but $3\frac{1}{2}$ cables wide, with a depth of about 10 fathoms in mid-channel; from abreast Middelburg beacon, bearing 1° true, the course is eastward towards Haarlem island, and south-eastward between Ubi rock white buoy on the west, and Ayer rock black buoy on the east; when Hoorn island is 0° true the course will be 115° true, towards Tanjong Priok harbour, northward of the shoals of Vader Smit and Van Dorth.

Outer channel is northward of Struisvogel rocks, Kombuis and Middelburg islands, and southward of Hoorn and Agenieten islands; thence northward of Dapur island, and between other islands in Batavia bay, to Old road or to Tanjong Priok harbour.

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Chart 933, Batavia roads. Var. 0° 30' E.

On approaching Struisvogel rocks, the white buoy marking the northern rock must be left to the southward; here the channel between it and Hoorn islands is 5 miles wide, with a depth of about 30 fathoms, mud, which becomes mixed with sand towards the islands and rocks. If approaching Outer channel from northward of Babi island, Payung island must be kept well open southward of Hoorn islands, to avoid Karbau shoal and the foul ground westward of those islands.

From a position one mile north of Struisvogel buoy (*Lat. 5° 53' S., Long. 106° 28' E.*), the course is parallel to Inner channel, or 106° true (avoiding Karang Laut of 3½ fathoms, by keeping Little Kombuis open northward of Great Kombuis), passing about 1½ miles northward of Great Kombuis, where the depth is about 15 fathoms, and southward of Tandul reef black buoy. From close southward of Tandul buoy, the red buoy on Menjumbang may be steered for, passing about 2 cables south; this avoids the patches of 4½ fathoms lying in the fairway. Or, taking the south side of the channel, pass northward of Lekapo and half a mile northward of Sau reef white buoys, keeping (when abreast the latter) the north side of Great Kombuis bearing about 263° true, astern; this bearing will lead northward of the white buoy north-east of Dapur island.

Vessels of great draught, to avoid the shallow places northward of Middelburg island, should take the deep channel, one mile wide and 25 to 30 fathoms deep, southward of Agenieten islands reef (always visible by discolouration of the water), and northward of the white buoys on Delima and Panjang di Laut reefs, which are on the north side of the Middle grounds. When eastward of the latter dangers, a course may be steered northward of Dapur island.

From one mile north-east of Dapur island, it is 8 miles 128° true to midway between Alkmaar and Enkhuizen islands; thence to New road, or Tanjung Priok harbour.

Bound for Old road, when past Middle grounds, vessels may steer south-eastward, west of Dapur island, and through Middle channel between Haarlem and Hoorn islands on the east, and Rotterdam island and Purmerend bank on the west.

At night, from westward, the channel between Payung and Agenieten islands should be taken. Passing half a mile southward of Babi island, bring the light 276° true, and on that bearing steer 84° true until Payung light is 31° true; the course thence is, about one mile south of the light, 68° true, and steer for Edam island light when it bears 126° true. Old road may be steered for when the *occulting* light of Batavia canal bears 180° true. If bound for Tanjung Priok harbour, pass a mile west of Edam island, and

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Chart 933, Batavia roads. Var. 0° 30' E.

when the light is 90° true, steer 114° true between Edam and Alkmaar islands, and for the harbour when the entrance lights bear 180° true.

Working in.—From Babi island to as far eastward as Little Kombuis (*Lat. 5° 57' S., Long. 106° 38' E.*), vessels working in may stand across both Inner and Outer channels, as the principal dangers are all buoyed. In Inner channel there is good anchorage everywhere, and vessels should anchor at dusk; but in Outer channel the water is deep.

Standing towards Tanjong Pontang, the mudbank is steep-to, and the north side of Panjang island should not bear westward of 266° true until the east point of Babi is 341° true; stretching into the bight beyond this, Pontang point may be kept westward of 276° true until the tree clump eastward of Tanara is westward of 191° true, as the north and north-east sides of Tanara bank are steep-to, and the lead gives no warning of approach. Eastward of it stand into the bight according to draught, avoiding the patches dry at low water, extending 8 cables northward of Changkir islet, by keeping Tanjong Kaik southward of 90° true. Menscheneter reef may be approached on its west side by the lead, but the north point (marked by a white buoy) and the east side are steep-to, as is also the extreme of Tanjong Untung Java reef. Between Tanjongs Kaik and Untung Java, the bank is shelving, but standing into the western portion of the bight, where the 5-fathoms line is close to the shallow reefs, the centre of Menscheneter island must be kept westward of 299° true. To the northward, the channel is clear between Struisvogel rocks and Great Kombuis, with the exception of Tongara rock, marked by a red buoy, and Karang Laut of 3½ fathoms, not marked; between Great and Little Kombuis there is another good channel, and also eastward of the latter, for which the chart is the best guide.

Towards Hoorn islands, Payung island should be kept well open southward of Great Tidung, to avoid the reefs westward of it; the reefs around Payung and Agenieten islands will be seen by discolouration of the water. Eastward of Little Kombuis, vessels should keep to the Outer channels, avoiding the neighbourhood of the dangerous shoals lying between Middelburg island and Sau reef buoy, and working up between the buoys marking the channels, or northward of Agenieten islands, eastward of which there is little danger with ordinary caution in reaching the roadstead.

Northern channels.—From Banka strait, when past North Watcher, the course is eastward of the Thousand islands, and a mile east or west of South Watcher; thence for Edam island, avoiding Karang Keroya by keeping Alkmaar island open westward of Edam. The patches westward and southward of Karang Keroya lie in this

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Chart 933, Batavia roads. Var. 0° 30' E.

route, but no other shoal water is believed to exist. When a mile west of Edam island, a direct course can be steered for Old road, or Tanjong Priok harbour.

By night, with North Watcher light bearing 315° true, steer 135° true until Edam island light is sighted bearing about 180° true. Bring it to bear 186° true and steer in on that bearing, which leads $2\frac{1}{2}$ miles eastward of Karang Keroya; and, from a mile east of Edam island, the entrance lights of Tanjong Priok harbour will bear 171° true, distant $7\frac{1}{2}$ miles.

Proceeding to Old road, when the *occulting* light of Batavia canal is seen, bring it to bear 179° true, and steer directly for the anchorage.

From eastward, pass 2 miles north of Tanjong Krawang (*Lat. $5^{\circ} 56' S.$, Long. $107^{\circ} 0' E.$*) by steering for Edam island bearing 251° true, and for Tanjong Priok when the harbour entrance is 211° true

By night, the light of Edam island 251° true will lead northward of Tanjong Krawang bank, and the *occulting* light of Batavia, bearing 224° true, should be steered for until Tanjong Priok harbour lights are observed.

For Old road, pass between Edam and Alkmaar islands, and for the anchorage when Batavia light bears 179° true.

TANJONG PRIOK HARBOUR.—The artificial harbour, and port of Batavia, rendered necessary by the delays of loading and discharging in the open roadstead, and by the urgency of modern steam traffic, was commenced on 1st May, 1877, and completed on 15th March, 1887, at a cost of £1,548,000.

The outer harbour is enclosed by two stone breakwaters, the eastern being 6,150 feet long, and the western 5,560 feet; the breadth of the harbour is from 2,000 feet near the north end, to 3,600 feet at the south end. The width of entrance between the heads is 525 feet. Lines of mooring buoys are placed on either side of the harbour, leaving in the centre a channel to the inner harbour; to these buoys vessels secure after discharging. The depth near the entrance is 28 feet, and $24\frac{1}{2}$ feet over other parts.

The dock basin, in the south-west part of the harbour, is 650 feet long, 130 feet broad, and $24\frac{1}{2}$ feet deep. On the eastern outer head of the basin, is a 25-ton crane.

The inner harbour, excavated into the land, is 3,500 feet long and 560 feet broad, with vertical quay walls, the floor being $24\frac{1}{2}$ feet below low water level. The coal wharf is on the east side; on the west side are five travelling cranes of $1\frac{1}{2}$ to $2\frac{1}{2}$ tons lifting power.

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Chart 933, Batavia roads. Var. 0° 30' E.

The harbour is connected with Batavia by railway, high road, and by canal.

Post, telegraph, and harbour offices, are in the vicinity of the railway station, and are open from 7 a.m. to 5 p.m. All parts of the harbour are electrically lighted. In the town of Priok (*Lat. 6° 6' S., Long. 106° 53' E.*) are shops, and a very good market.

For sanitary reasons, eucalyptus and other trees have been largely and successfully planted.

The water of the harbour being contaminated by sewage and marsh drainage, and thereby liable to introduce fever, should not be used for deck washing or any other purpose.

Pilots.—By day the pilot vessel flies a blue flag, with P.T. in large white letters. At night, a steam pilot vessel carries a *red* light over a *white* light; the pilot sloop has a *red* light. Pilotage is compulsory for all ships, including men-of-war, unless the Harbour master has given permission for a ship to enter or leave the harbour without a pilot.

The signal is the usual pilot flag, the national flag at the foremast head, or the flags P.T. of the International code. The pilot flag is to be hoisted before reaching the anchorage, and kept flying until the pilot is on board. Mail packets and ships of war have precedence.

Masters of vessels desiring permission to enter the harbour of Tanjong Priok at night, must make the signal for a pilot according to the International code, viz.:—a *blue* light every fifteen minutes, or a *white* light shown at intervals above the bulwarks; a rocket fired from the Time ball station in reply indicates that permission is given, and that a pilot is being sent.

Between sunset and sunrise, pilotage rates, into or out of the harbour, are doubled, and a permit is required from the Harbour master.

The pilot, on boarding, is to be furnished with the names of ship, and master; nationality, last port of departure, and destination. Should the bill of health be in any degree unsatisfactory, the ship will not be taken into harbour.

The tariff of pilot services, and abstract of regulations, can be seen, or obtained, at the pilot office.

Tugs are always at hand to tow vessels in or out of harbour, or to help in swinging or removing.

Port regulations.—The police of Tanjong Priok have jurisdiction over the Old and New roads of Batavia, as well as over the harbour, and are under the direction of the Harbour master.

No vessel may enter or leave the harbour, nor shift berth within, unless in charge of a pilot, nor anchor in the fairway or channel.

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Chart 933, Batavia roads. Var. 0° 30' E.

Ships of more than 24½ feet draught must obtain from the Harbour master a permit to enter.

A speed of 5 miles an hour is not to be exceeded.

Special moorings are reserved for ships of war.

Ships with dynamite, gunpowder, petroleum, or other inflammable articles, are not to enter the harbour, but anchor outside as directed. Also should any contagious or infectious disease be on board, the quarantine flag is to be hoisted, and permission obtained before it is hauled down.

The health officer will board from the guardship, moored on the western outer part of the harbour.

There is a small naval hospital for contagious diseases.

When entering the harbour, an anchor should always be ready, in case of missing the buoys through baffling winds or other causes.

Coal.—Coal and liquid fuel are obtained from the wharves on the east side of Tanjong Priok harbour. The loading capacity is about 500 tons per day. Vessels in the roads are supplied by lighters; in the western monsoon there is sometimes delay in completing both coal and water. About 2,500 tons of coal, and 2,000 tons of liquid fuel are usually kept in stock. Coaling ceases at 5 p.m., and ships should leave the coaling wharf before sunset on account of the malarial mosquitoes which infest the inner harbour.

Coal wharves.—There are two coal wharves, 4,000 feet and 2,500 feet in length, with a general depth of from 22 to 23 feet alongside.

Water is supplied from the reservoir, which is fed by three artesian wells. On the moles of the outer harbour are eight hydrants, and in the inner harbour three; vessels alongside are supplied direct by hose. The water is free to ships of war. Ships in the road are supplied from tanks, but this water was reported to be unfit for drinking, or washing, in 1911.

Docks.—See Appendix.

Repairs to ships and engines are undertaken by the Tanjong Priok Dock company.

Time signals (*Lat. 6° 6' S., Long. 106° 53' E.*) are made from the look-out on the east side of the inner harbour, near the entrance.

The signal apparatus consists of an iron frame with four arms, at the end of each being a flat spherical board which can be seen in all directions. These boards, 5 minutes before the time of signal, are inclined at an angle of 45°; placed vertically 2 minutes before; and dropped horizontal at noon (Central Java mean time) corresponding to 16h. 40m. 45.5s. Greenwich mean time.

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Chart 933, Batavia roads. Var. 0° 30' E.

Should the signal fail, a red flag with white centre will be hoisted until 0h. 55m. p.m., and the signal repeated at 1h. 0m. 0s. Central Java mean time.

A blue flag hoisted at 11h. 30m. a.m. or after the failure of the noon signal, signifies that no further signal will be made on that day.

These signals are not shown on Sundays or holidays.

At night, signals by the Morse code can be exchanged.

BATAVIA (*Lat. 6° 9' S., Long. 106° 49' E.*), the capital of the island of Java, and seat of the Government of Netherlands India, was founded in 1619, and is one of the large commercial centres in the East. It is divided into two parts, the old and the new. The old town originally stood on the seashore, but the advance of the foreshore has been such, that it is now a mile inland; it is an oblong of about three-quarters of a mile in length, and half a mile in width, covered with stone buildings arranged in squares, surrounded and intersected by canals, traversed by numerous bridges. The place is unhealthy, and the merchants and officials retire to the new town as soon as the day's business is over, thus partly avoiding the miasma arising from the swamps, which is carried seaward by the land wind prevailing at night. South-west of Old Batavia is the closely packed Chinese and native town, of about one square mile, also intersected by canals.

New Batavia, on the higher ground southward of the old town, is a widespreading area of well-designed avenues, planted with shady trees, and containing the palace of the governor-general, hospital, barracks, parade ground, and various public buildings, with bazaars, shops, hotels, and many private residences. The principal quarters are Molenvliet, Noordwijk, Rijswijk, and Weltevreden. A steam tram runs from the old town to the village of Melaju, beyond Meester-Cornelis, a distance of 8 miles.

The great canal, which is in connection with all the waterways of Batavia, is fed by the Sungi Chi Liwung. The seaward piers project from the high water line in a northerly direction for $1\frac{1}{2}$ miles; through the eastern pier, about $3\frac{1}{2}$ cables from the end and abreast the main light, there is a passage for boats. Before the construction of Tanjong Priok harbour, this canal was the highway for inland traffic, now forwarded by railway to that port; it is still largely used by small vessels and native boats, the necessary depth being maintained by dredging.

Climate.—The lower town of Batavia is rendered unhealthy by the exhalations from the marshes which extend along the foreshore of the bay. Inland the island is more healthy. Batavia fever prevails at the change of monsoons, particularly about October, the latter part of the dry season, which is more unhealthy than the wet season.

General charts 2056, 1653, 941a, 1263.

Chart 933, Batavia roads. Var. 0° 30' E.

Vessels intending to make a long stay in the road are recommended to anchor well off-shore, to avoid as much as possible the miasma thrown off by the land wind. Sleeping on shore should be avoided. Temperature observations apply generally to the whole north coast of Java; the mean maximum day reading of the thermometer is 80°, and minimum 77°; very rarely does it rise to 90°, or fall below 70°, the latter being experienced only at night, during June, July, and August.

The rainfall varies much from year to year, and averages 72 inches, over 137 days. The greatest fall is 14 inches, during 21 days, in January; the least in August, of 4 days, with 1½ inches. The wettest months are January and February, and the driest July, August, September. At Buitenzorg, 25 miles inland, the annual fall is 174 inches, and thunderstorms are there very frequent.

Cholera in epidemic form broke out in Batavia towards the close of 1896, during which time the deaths were on an average about 60 per week; the outbreak was principally amongst the natives, though Europeans were by no means free. In 1897, cholera appeared only in a sporadic form, and the general health was satisfactory.

The mortality in New Batavia is said to be less than in any other tropical town.

Wind.—The mean directions of the wind at Batavia (*Lat. 6° 8' S., Long. 106° 49' E.*), in the eastern monsoon are: at 9 a.m. 162° true, at 2 p.m. 31° true, and at 6 p.m. 35° true; in the western monsoon the directions at the same hours are 235° true, 352° true, 318° true.

The sea breeze sets in about 10 a.m., and, in the eastern monsoon, brings the wind into north-east until 6 p.m.; the land wind coming off about 8 or 9 p.m. In the western monsoon, the sea breeze deflects the west wind into north-west, and the land wind is not apparent.

Population.—In 1905, the population of Batavia was 138,351, of which 8,777 were Europeans and the remainder natives and other Asiatics.

Observatory.—The Observatory, which was formerly in the old town, has been removed to New Batavia (*See Standard time, page 3*).

Hospital.—There is a large military hospital, in which seamen and civilians are admitted. There is one sailors' boarding-house.

Railways.—Batavia has railway communication eastward with Tanjong Priok and Bekasi, westward to Serang and Anjer, also southward to Buitenzorg, thence over nearly the whole length of Java. The gauge is 3½ feet.

Telegraphs.—Batavia is in connection by telegraph with the principal towns in Java, and by submarine cables with all parts of

General charts 2056, 1653, 941a, 1263.

Chart 933, Batavia roads. Var. 0° 30' E.

the world. With Europe by way of Singapore; with Australia, from Banjuwangi to Port Darwin and Roebuck bay; with Sumatra, from Fourth point to Kalianda; and with Makassar, from Landangan and Beliling.

Telephonic communication is established between Batavia, Samarang, Surabaya, Tegal, Cheribon, and Pekalongan, which is working quite successfully. The tariff, per conversation of 3 minutes, is: to Samarang, distant 236 miles, 5 florins; Surabaya, 384 miles, 6 florins; and to the remaining places, 160 to 192 miles distant, 2½ florins.

Wireless telegraph.—A wireless telegraph station at Weltevreden (*Lat. 6° 10' S., Long. 106° 49' E.*) is open to the public on Thursdays from 8h. a.m. to 9h. p.m.; on other week-days from 8h. a.m. to 6h. p.m.; on Sundays and public holidays from 9h. a.m. to 1h. p.m., Java mean time. The call letters are P.K.B.

Shipping.—In 1912, 337 steam vessels of 1,765,589 tons, and 8 sailing vessels of 8,783 tons, entered the ports of Batavia and Tanjong Priok. Of these, 132 steam vessels of 646,922 tons were British.

Trade.—The principal articles of export are cinchona bark, coffee, gums, hides, indigo, pepper, and other spices, rice, sugar, tea, tin, tobacco. Imports are manufactured goods in cotton, wool, earthenware, lead, and zinc; with coal, petroleum, spirits, dried fish, and other domestic stores.

Communication is maintained direct with the Netherlands, by the Netherlands and Rotterdam Lloyds steamship companies, which maintain a weekly mail service *via* the Suez Canal; the first-named company employ, in addition, a special line of freight steamers; also with Europe, *via* Singapore, by the Peninsular and Oriental, British India, and Messageries Maritimes companies. There are also inter-colonial and local steamers to all parts of the Netherlands Indies; a list of these is given on page 9.

Supplies of all kinds may be procured at Batavia; poultry, excellent fruit and vegetables are plentiful and moderate in price.

General charts 2056, 1653, 941a, 1263.

CHAPTER V.

TANJONG KRAWANG TO SURABAYA STRAIT, INCLUDING KRIMON
JAVA ISLANDS.

VARIATION IN 1914.—Decreasing about two minutes annually.

Chart 1653, Island of Java, western portion. Var. 0° 40' E.

GENERAL REMARKS.—The north coast of Java, from Tanjong Krawang to Tanjong Tanah, a distance of 100 miles, is flat and covered with large trees. It shows no prominent objects by which strangers can readily recognise locality; but inland, at distances of from 24 to 40 miles, there are several conspicuous mountains, which are often seen during the western monsoon, though but rarely in the eastern, as the weather is then hazy. Mount Pangerango has been already mentioned (page 75); north-east of this is Mount Sanga Buana, a round saddle-shaped mountain 4,259 feet high; then occur the Gehakkelde mountains, showing several sharp peaks, the most western and highest of which rises to 3,176 feet. South-east of Gehakkelde mountains is Mount Tangkuban Prau, 6,798 feet high, and looking like a vessel bottom upwards; there is an extinct crater on its east side. Eight miles further to the east is Mount Tungul, so called from its being bare, with an elevation of 7,244 feet. Nine miles further east-north-east is Tampokmas, an isolated conical mount, with a round top, 5,522 feet high, whilst 11 miles west of Cheribon and 211° true, 18 miles from Tanjong Tanah, there is a chain of low peaks, named Keromong, the highest being 1,919 feet, and 10 miles southward is Mount Chiremai (Chareme) or Cheribon peak, 10,076 feet high, a truncated, conical volcano, from which smoke rises occasionally. On the coast, in the vicinity of Cheribon, is Jati hill, of 197 feet.

The coast is more diversified eastward of Tanjong Tanah, and from thence to Surabaya strait, with some mountainous country close to the shore.

Chart 933, Batavia roads.

TANJONG KRAWANG (*Lat. 5° 56' S., Long. 107° 0' E.*), the eastern boundary of Batavia bay, is low and muddy. It may be recognised by some conspicuous trees on its western extremity, and a clump of high trees at the eastern end, visible from a distance of 13 miles. Eastward of the point the Sungai Belubuk, an outlet of the

General charts 2056, 1653, 941a, 1263.

Chart 933, Batavia roads. Var. $0^{\circ} 40' E$.

Chi Tarum, disembogues. It is only navigable for small vessels. A mudbank, which is probably working out to the northward, extends off-shore a distance of one mile; this bank is steep to outside the depth of 3 fathoms, and at a distance of 2 miles from the point the depth is 12 to 13 fathoms. In rounding this point it is advisable not to shoal the water to less than 12 fathoms.

Chart 2056, Sunda strait.

Tanjong Bungin.—Tanjong Bungin, $5\frac{1}{2}$ miles east of Tanjong Krawang, is a low promontory, covered with trees, with a sandbank extending 3 miles to the northward and north-eastward, on which there are patches of 9 feet. The Sungi Bungin, another outlet of the Chi Tarum, discharges itself at Tanjong Bungin, and is navigable for praus. There are some high trees on either side of the entrance.

Pakis reef, which frequently breaks, has a depth of 3 fathoms over it, and is situated about 2 miles to the northward of Tanjong Bungin.

To avoid it, Tanjong Krawang should be kept southward of the bearing 243° true; at night keep Edam light south of 248° true, and do not shoal the water to less than 12 fathoms.

Chart 1653, Java, western portion.

Tanjong Sedari, 13 miles east of Tanjong Bungin, is a round promontory which derives its name from the village close to. About 3 miles east of Tanjong Bungin is the village of Pakis, readily recognised by the cocoanut trees in its vicinity, while close to the village of Sedari, at mouth of the small river of that name, there is a line of high casuarina trees which may be seen from the offing at a distance of 14 miles.

Sedari reef (*Lat. $5^{\circ} 54' S.$, Long. $107^{\circ} 25' E.$*) consists of two sandbanks within the 10-fathoms contour line north-east of Tanjong Sedari. On the outer bank, which is 6 miles from the coast, and extends in a north-west and south-east direction for 2 miles, the least water is 4 fathoms, the bottom being black sand and broken shells. On the inner sandbank, which is 4 miles from the shore, there are several patches of $2\frac{3}{4}$ to 3 fathoms. There is a passage one mile wide between the two banks, in which the depths are from 8 to 10 fathoms, mud. The depths increase rapidly to 15 fathoms outside the outer bank. Between the inner bank and the shore is a passage of 4 to $4\frac{1}{2}$ fathoms 2 miles from the coast. To avoid these dangers it is advisable to pass outside the northern bank, for which purpose, having passed Tanjong Bungin at a distance of 4 miles, steer 86° true, and pass Tanjong Sedari at a distance of from 8 to 9 miles, keeping in not less than 12 or 14 fathoms. At this distance Tanjong Sedari is just visible from the deck.

Coast.—From Tanjong Sedari the coast trends south-easterly towards Sedulang islands, and between Sedari reefs and these islands

General charts 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 0° 40' E.

the soundings decrease regularly towards the shore, so that the lead is a good guide. The depths are 5 to 6 fathoms at from 3 to 4 miles from the coast. On the coast are the villages of Chemara and Sungi Buntu, both having cocoa-palms near them. In the centre of those near Sungi Buntu village is a high casuarina tree, which can be seen from an offing of 14 miles when the rest of the coast has dipped.

Sedulang islands are a group of coral islets and reefs extending for a distance of 8 miles along the shore, the outermost reef being 4 miles from the coast, but they are reported (1913) to have almost disappeared through subsidence, and caution is necessary in their vicinity. Chiparagah, at the north-western end of the group, is a sandbank 50 yards long. Reefs, dry at low water, extend one to 3 cables from it, and three sandbanks above water lie south-west. Four miles 114° true from Chiparagah and 2 miles from the shore is Jumanjang islet, about 2 cables long and $1\frac{1}{2}$ wide, which now covers, but a dead tree projects above water. Half a mile 35° true from Jumanjang is Tamiang, a ring-shaped ridge of coral rocks a cable in diameter, with a dead tree projecting above water; and 2 miles 125° true from Jumanjang is Pagak, upon which there is a white pillar, one of the marks of the Trigonometrical Survey of Netherlands India. This small reef is three-quarters of a cable in length.

One mile west of Pagak is Kali Sungu reef, 4 cables long and nearly 3 cables wide; whilst three-quarters of a mile 12° true from Pagak is Ketapang, a small round white coral islet covered with bushes, a quarter of a cable in diameter, surrounded by reefs which extend in places more than 3 cables off. Half a mile northward from Ketapang is Jambatan reef, 3 cables in length and one in breadth, which dries at low water, but is covered entirely at high water, with an isolated coral patch of 7 feet at low water $1\frac{3}{4}$ cables south-east of it.

One mile 294° true from Jumanjang is Pasir Putih, a coral reef $3\frac{1}{4}$ cables long with a few low trees on its north side, and a small white sandbank on the south side, and three-quarters of a mile 12° true from this reef is another one, 2 cables long, named Gundul Pasir Putih, which has a white coral patch near the centre, whilst at a distance of one and 2 cables from this last-mentioned reef on the east side are two coral patches of 4 and 8 feet at low water. Close to the shore are Grobogan reef, Kalen Tinghi island, and Kalen Tinghi reef, but these are out of the track of vessels.

Sedulang reefs (*Lat. $6^{\circ} 7' S.$, Long. $107^{\circ} 35' E.$*), about 15 in number, of various dimensions, occupy about a mile square in area,

General charts 941a, 1263.

Chart 1653, Island of Java. Var. 0° 40'E.

northward of Jumanjang and Tamiang islets; some dry at low water, but on others the depth varies from 3 to 12 feet. Breakers frequently mark their position.

Between Sedulang islands there are channels for small vessels, but they are seldom used, and do not merit description. In passing this part of the coast or in working to windward, a depth of 9 fathoms preserves a distance of 2 miles from them. A few small villages, inhabited chiefly by fishermen, are on the shore.

COAST. — Eastward of Tanjong Prau Busuk is Chiasem bay, 9 miles wide and 4 miles deep; the eastern boundary is Tanjong Pamanukan. Several small rivers flow into this bay, but they have all bars with $1\frac{1}{2}$ to 3 feet water over them, and are consequently only available for praus. The two principal streams are named Chi Lamaya and Chi Asem; near the mouth of the former lies the village of Muara Chilamaya, and 2 miles further up the town of Chilamaya, the capital of the district. At the entrance of the Chi Asem river are some high trees, by which it may be recognised, and 4 miles from the mouth is the town of Chiasem.

Chiasem rock.—Almost in the centre of Chiasem bay is Chiasem rock, a coral rock on which the least depth is $2\frac{1}{2}$ fathoms; it is about 30 yards in diameter and 3 miles from the shore. From it Tanjong Pamanukan bears 86° true, distant 6 miles. Outside the rock the depth is $4\frac{3}{4}$ fathoms.

Anchorage.—Vessels anchor in the bay off the mouths of the rivers, to receive and discharge cargoes by cargo boats, in depths of about 4 fathoms, and are said to lie securely during the west monsoon. To avoid Chiasem rock when proceeding for the anchorage off Chi Lamaya river, keep the village of Muara Chilamaya on a 226° true bearing; and when bound for the anchorage of Chi Asem river, high trees at its mouth 176° true.

Tanjong Pamanukan (*Lat. $6^\circ 12'$ S., Long. $107^\circ 46'$ E.*) is a steep promontory thickly wooded and readily recognised. Tanjong Bobos, $2\frac{1}{2}$ miles eastward, is low. Tanjong Pamanukan and the coast between it and Chiasem rock may be approached by the lead, and the anchorage is good and fairly sheltered in the east monsoon. Between Tanjongs Pamanukan and Bobos there is a small bay. The entrance to the Chi Punegara is at the north-east extreme of Tanjong Pamanukan; the depth over the bar is only half a foot at low water in the dry season. Close to the mouth of the river is the village of Legon. On the east side of Tanjong Bobos is the mouth of the Kwala Bobos; over the bar the depth is $1\frac{1}{2}$ feet in the dry, and 4 feet in the rainy

General charts 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 0° 40' E.

season. This river is the outlet for the produce of the districts of Pamanukan and Chiasem, which is brought off in cargo boats. Tanjong Bobos is reported (1913) to have extended one mile northward, and should not be rounded at a less distance than $1\frac{1}{2}$ miles, or the soundings decreased to less than 6 fathoms.

Anchorage.—The usual anchorage was in from 4 to 5 fathoms, with Tanjong Bobos bearing 152° true, and the west extreme of Tanjong Pamanukan 233° true, but it is reported (1913) to be greatly altered.

PAMANUKAN ROCK (*Lat. $6^\circ 1' S.$, Long. $107^\circ 53' E.$*).—A dangerous coral rock $1\frac{1}{2}$ cables in length and one cable in breadth lies 12 miles 31° true from Tanjong Pamanukan. The depth on it is 9 feet, with soundings of 12 to 16 fathoms close around. The rock is sometimes marked by rippings, and the water in its vicinity is discoloured. From it Tanjong Pamanukan, which is just visible, looks like an island.

Light-buoy.—On the north-east side of the rock is a black light-buoy showing an *occulting white light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*.

Directions.—As Pamanukan rock lies in the track of vessels navigating the north coast of Java, ships usually pass well to the northward. The channel, however, between it and Tanjong Pamanukan is clear, with depths increasing from the shore to 17 fathoms. The depths are somewhat irregular, as there are ridges in the channel over which the soundings are 2 fathoms less than inside them. Vessels working to windward against the prevailing monsoon will find it advantageous to pass between the rock and the land, not only to obtain the use of the land and sea breezes, but also because the anchorage is safer and the water smoother close to the shore. The lead must never be neglected, nor the rock approached to a less depth than 15 fathoms.

Sand ridge.—Eastward 6 miles from Tanjong Pamanukan, at a distance of from 3 to $3\frac{1}{2}$ miles from the shore, is a narrow sandy ridge parallel with the coast, 3 miles in length, the depth being $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms; it is steep-to.

COAST.—Eastward of Tanjong Bobos the coast runs in an east-south-east direction for 20 miles, when it turns northward and north-eastward, forming Tanjongs Sentigi and Inderamayau. The shore affords good landing and may be approached by the lead, as the depths decrease regularly. It is well wooded, and some small rivers discharge into the sea, near which are some villages. Kwala Sewo (Sewu), containing oyster beds near its mouth, is salt for some distance inland, and has a bar of one to 2 feet at low water. On the west side is the village

General charts 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 0° 40' E.

of Patimban, which can be seen from the offing, and on its east side the village of Ujong Gebang, readily recognised by a group of tall cocoa-palms. Further east is the mouth of the Kwala Kandanghauer, with the village of Eratan close to, which may be distinguished by some scattered palms with bare stems, and the red roofs of its houses. Four miles east of the mouth of the Kwala Kandanghauer are three or four remarkable casuarina trees, visible at a distance of 12 miles from seaward, forming a good mark for the entrance of a canal to Losarang, named Muara Chemara. This canal, which is only navigable for praus and small craft, forms at its mouth a broad creek, the entrance of which is marked by a flagstaff and beacon with a triangle.

Anchorage.—Vessels anchoring off the canal should not approach nearer than 2 miles nor a depth of $4\frac{3}{4}$ fathoms. The anchorage marks are the flagstaff, 142° true; the casuarina trees, 186° true; and Sentigi wood, 71° true. Inside the 3-fathoms contour line the depths decrease rapidly.

Tanjong Sentigi is a promontory projecting to the north-westward of the coastline between Muara Chemara and Tanjong Inderamayu. At its extremity are two small points with a small bay between; the northernmost of these is overgrown with low trees, and the whole promontory is subject to much waste. A bank of sand and mud extends from it about one mile seawards, and is generally known from the discoloration of the water. In working along the coast Tanjong Sentigi should not be approached nearer than at a depth of 7 to 8 fathoms.

Tanjong Inderamayu (Indramayu) (*Lat. $6^\circ 14'$ S., Long. $108^\circ 18'$ E.*).—East of Tanjong Sentigi is a bay 2 miles in depth, from which the coast trends to the north-eastward, forming Tanjong Inderamayu, a promontory covered with low trees, from which a bank of hard sand extends to a distance of 2 miles north-eastward, with patches of 3 fathoms on it. This bank is steep-to, and vessels rounding Tanjong Inderamayu should not come within $2\frac{1}{2}$ or 3 miles of the coast, or shoal the water to less than 14 fathoms.

Inderamayu roads.—There is a roadstead on either side of Tanjong Inderamayu, that to the westward being called West road, and the other one East road. The Chi Manuk river has an entrance from West road, and there is a canal to the town of Inderamayu, on the river about 5 or 6 miles from its entrance from East road, so that communication between vessels and the town can generally be maintained during either monsoon. In the east monsoon West road is mostly used, and during the west monsoon East roadstead, but this latter is much exposed to the sea when the wind draws to the north-west.

General charts 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 0° 50' E.

The usual anchorage in West roadstead, in $4\frac{3}{4}$ fathoms, is with Tanjong Inderamayu 80° true, and the north point of Sentigi promontory 226° true, about 2 miles from the mouth of the Panjar Jala. The anchorage in East roadstead is in 3 to 5 fathoms, with the flagstaff at the entrance of the canal in line with a group of casuarina trees 237° true. The real mouth of the Chi Manuk river, which is at Tanjong Inderamayu, is not navigable, but praus make use of a small branch in West road named Panjar Jala, a narrow creek generally beacons with stakes, in which, however, the depth at low water is from a half to one foot only. The canal from Inderamayu to East road, named Praya Gumiwang, is about 3 miles in length. In the dry season it is usually shut off from the river by a lock, and then silts up so that it can only be used at high water; but in the rainy season it is frequently sluiced, and by this means a better channel secured at the entrance. In the canal itself the depth is 5 feet at low water.

Light-buoy.—A light-buoy, with red and black horizontal stripes, is moored in 5 fathoms of water off the eastern side of Inderamayu West road. It exhibits an *occulting white light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*.

Supplies.—Provisions may be obtained from the town of Inderamayu, but no coal. Water is bad. The principal produce is rice and coffee.

Caution.—The current is occasionally strong near Tanjong Inderamayu. In November an easterly set of 2 miles an hour has been observed.

BOOMPJES ISLAND and adjacent reefs.—Boompjes or Menjawk (Rakit) island, 18 miles, 15° true, from Tanjong Inderamayu, is a thickly-wooded coral island, one mile in length east-south-east, and half a mile in breadth, encircled by a reef extending from one to 3 cables from the shore, close outside of which the depths are 20 to 28 fathoms, blue mud with sand and shells. On the south side of the island is a lighthouse, and from the shore near it a stone pier reaches to the edge of the reef. At the inner end of the pier is a flagstaff, and on its east side two small beacons, the eastern one white, with a ball, the western black, with a triangle.

LIGHT (*Lat. $5^\circ 56'$ S., Long. $108^\circ 23'$ E.*).—A group flashing white light, showing a group of three flashes every fifteen seconds, is exhibited, at an elevation of 179 feet, from a white ironwork tower, 191 feet high, situated 50 yards from the south side of Boompjes island, and should be seen from a distance of 20 miles.

Middle reef or Gusong (Gosong), 4 miles 15° true from Boompjes island, is a coral atoll 2 miles long, east-south-east, and one mile broad.

General charts 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 0° 50' E.

At high water the reef is completely covered; at low water several rocks dry. In the lagoon in the centre of the atoll the depth in places reaches 15 fathoms, sand and mud.

North reef or Chandikian lies 4 miles 36° true from Middle reef, and is 2½ miles in length east and west, and three-quarters of a mile in breadth. This reef also is a coral atoll which is covered at high water, but many rocks are uncovered at low water. The depth is 7 fathoms in the lagoon. Both Middle and North reefs are steep-to, with depths of 20 to 28 fathoms close-to. They are usually marked by discoloured water.

The channels between the reefs, and between Boompjes island and Middle reef are free from danger, the depths being from 25 to 29 fathoms. The usual track pursued is, however, between Boompjes island and Inderamayu point.

Wind and currents.—At Boompjes island, from April to September, the mean direction of the wind is, at 9 a.m., 135° true; 2 p.m., 104° true; 6 p.m., 102° true. And in the other season, October to March, at the same hours respectively, 240° true; 315° true; 312° true.

Currents in this neighbourhood are entirely wind-drifts, setting eastward from December to March, with maximum strength in January and February; and westward from April to November, being strongest from July to October. The volume of stream to the west is considerably in excess of that to the east.

Tides are diurnal, with occasional indications of a second tide.

COAST.—**Tanjong Tanah** (*Lat. 6° 28' S., Long. 108° 32' E.*).

—From Tanjong Inderamayu the coast runs in a south-easterly direction for 21 miles to Tanjong Tanah, which is low, covered with bushes, and seems to be wasting. There are villages near the shore, the trees being higher in their vicinity, with an occasional glimpse of the houses. The most conspicuous object, however, is the tall white chimney of a sugar factory in the village of Karangampel, and is a good mark for making the village of Dadap, 5½ miles west of Tanjong Tanah. From Tanjong Tanah the coast runs in a general south-by-easterly direction for nearly 20 miles, and then turns to the eastward.

Anchorage may be obtained to the north-westward of Tanjong Tanah, in 4½ fathoms, with the chimney of the sugar factory of Karangampel bearing 203° true. The depths here gradually decrease to the shore.

TANAH REEF and CHERIBON BANK.—A large bank of shoal water extends from Tanjong Tanah; if the 3-fathoms contour

General charts 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 0° 50' E.

line is taken as its edge, the bank extends 10 miles east-south-east, and is 8 miles wide, covering thus an area of 80 square miles; but outside the 3-fathoms edge soundings of less than 5 fathoms extend nearly across to Tanjong Losari, which lies 27 miles 131° true from Tanjong Tanah. This shoal is composed of sand and mud alternating with broken shells. It is steep-to on the north side, but the depths increase very gradually to the south-eastward. Between the edge of the bank and the shore from Tanjong Losari to Cheribon there is a gully with depths of $5\frac{1}{2}$ to 6 fathoms, which is marked by buoys.

Wrecks.—On the north-east side of the bank, 8 miles from Tanjong Tanah, there is a wreck with her masts above water, to which a black ball has been attached, and the wreck of a steam vessel 8 miles 39° true from Tanjong Losari.

Buoys.—A white light-buoy is moored on the eastern side of Tanah reef in $5\frac{1}{2}$ fathoms, and exhibits a *white occulting light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*.

A white conical buoy, with staff and ball, is moored in $3\frac{1}{2}$ fathoms on the south-east side of Tanah reef.

The gully between the south edge of Cheribon bank and the shore is marked by a white conical buoy on its northern side, and a black light-buoy, exhibiting an *occulting white light* on the south side.

Jati hill (*Lat. 6° 40' S., Long. 108° 32' E.*), 11 miles south of Tanjong Tanah, is 197 feet high, covered with trees, and conspicuous as the only elevation near this part of the coast, which, with this exception, is low from Tanah point to Cheribon.

Mount Keromong, 1,919 feet high, is 11 miles westward from Cheribon, and 15 miles south-west is Mount Chiremai or Cheribon peak; these are both useful as marks.

Plan of Cheribon road on 932.

CHERIBON.—The town of Cheribon is on the coast about 14 miles south of Tanjong Tanah, and is not far from the north-eastern slope of Mount Chiremai; it is the capital of the Cheribon district, and is about half-way on the high road from Batavia to Semarang. It is a place of considerable importance, exporting sugar, coffee, indigo, and teakwood; and there is communication by steamer with Batavia and the other ports, as the Netherlands India Steamship Company's vessels call here once a week. *See view at page 110.*

Population.—In 1905 the population was 23,540, including 499 Europeans and 3,136 Chinese.

General charts 941a, 1263.

Jati hill.

Mt. Chiremati.

Mt. Tampomas.



House with zinc roof.

Lighthouse bearing 237° true, 24 m.

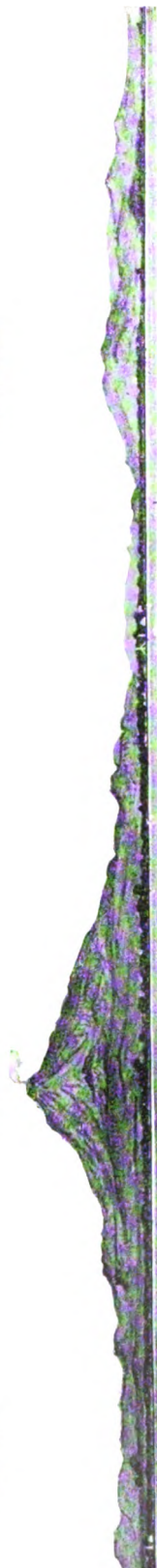
Keronong.

Cheribon road.

Mt. Gajah.

Mt. Slamet.

Mt. Kumbany.



*Chimney
Maribaya.*

Lighthouse bearing 204° true, 44 m.

Mt. Tapak.

Tegal road.

Mt. Prahu.

Mt. Rajanbangun.

Mt. Slamet.



Lighthouse bearing 180° true, $2\frac{1}{2}$ m.

Pekalongan road.

Mt. Gajah.

Plan of Cheribon road on 932. Var. 0° 50' E.

Telegraph.—Cheribon is in telegraphic communication with the principal places in Java.

Supplies.—Good supplies can be obtained at Cheribon, but coal in any quantity is difficult to obtain. Water is scarce and bad in the dry season, but abundant in the rainy season.

Harbour.—A boat harbour at the north end of the town, formed by two piers, facilitates the loading of ships in the roadstead. Communication is occasionally interrupted. There is a 12-ton crane on the quay.

LIGHTS (*Lat. 6° 43' S., Long. 106° 34' E.*).—A group flashing white light, showing every half-minute, three flashes of three seconds each, eclipse between flashes three seconds, between groups fifteen seconds, is exhibited at the inner end of the mole from a white iron framework, at an elevation of 51 feet, visible in clear weather 10 miles. The height of the frame is 46 feet.

A fixed red light is shown from the head of the eastern mole, 400 yards from the white light.

Anchorage.—The usual anchorage is in 3 to 4 fathoms, with the harbour light bearing between 226° and 271° true, distant about 2 miles.

Directions.—Cheribon road, which in the western monsoon affords good anchorage, is to large ships encumbered by Cheribon bank. Vessels from westward should keep in 7 or 8 fathoms, until Mount Keromong is in line with Jati hill, bearing 249° true; and southward of this line may cross the bank in not less than 3½ fathoms. When over the bank, the water will deepen to 6 fathoms, in the gully off the town, then shoals again to the shore. Vessels of deeper draught use the buoyed channel to the southward of Cheribon bank.

Chart 1653, Island of Java, western portion.

Tanjong Bangka.—Southward of Cheribon the coast curves eastward to Tanjong Bangka, which is low, being formed from the alluvium of several small rivers. It may be approached within a distance of 2 miles or a depth of 5½ fathoms. Four miles east of Tanjong Bangka is the village of Gebang, surrounded by cocoanut trees; and 8 miles further eastward there is a sugar factory with a blue roof and low white chimney.

Tanjong Losari, 12 miles eastward of Tanjong Bangka, is also low, being formed by the deposit of the Kwala Losari, which has four mouths. A bank of sand and mud extends off the point, not to be approached nearer than 2 miles, in the depth of 5 to 5½ fathoms. From the offing the trees on the main road between Cheribon and Tanjong Losari are occasionally visible.

General charts 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 0° 50' E.

Tanjong Berebes (*Lat. 6° 48' S., Long. 109° 1' E.*), 9 miles east of Tanjong Losari, is formed in much the same manner as the latter by the Kwala Pemali. It may be recognised by some high trees on the river bank $1\frac{1}{2}$ miles from the entrance, and visible long before the other parts of the coast. The point also should be passed at a distance of 2 miles where the depths are $6\frac{1}{2}$ to 7 fathoms.

Although the coast is low between Cheribon and Tanjong Berebes, it begins to be elevated 4 miles inland. A mountainous chain extends from the southern slope of Cheribon peak to the eastward, parallel to the coast at a distance of 20 miles, terminating in Mount Kumbang, a round-topped mountain, 4,013 feet high. Nearer the coast are several detached hills, such as Tukung, 604 feet, Tapak, 1,115 feet, and Siranchang, 479 feet high, all easily distinguished, and useful in fixing the position of a vessel passing along the coast.

Anchorage.—Between Tanjongs Losari and Berebes there is a bay 3 miles deep, with fairly sheltered anchorage in either monsoon. At the head of the bay is the fishing village of Pulogading, and on the west side a hamlet called Krakahan. Vessels may proceed into this bay by the lead, and anchor during the west monsoon under Tanjong Losari in 3 to $3\frac{1}{2}$ fathoms.

Plan of Tegal road on 3311.

TEGAL.—From Tanjong Berebes the coast runs in an east-south-easterly direction for 8 miles to the town of Tegal, the shipping port of the province of Tegal. It is situated at the mouth of the small Kwala Wadas, and contains some good buildings, a roomy market place, and several native boat-building yards. View at page 110.

Communication.—There is a line of railway from Tegal to Balapulung in the interior. The vessels of the Netherlands India Steamship Company call here three times a month.

Population.—In 1905 the population of Tegal was 32,344, including 614 Europeans.

Supplies.—Water is obtained from artesian wells, some of which near the shore are bad. Other supplies are plentiful and excellent.

Harbour.—A small harbour, 547 yards long and 33 yards broad, has been formed at the entrance of the river, and is kept open by dredging. It is used by praus which take off cargoes to ships in the roadstead, but the depth in it at times is not more than 2 to 3 feet at low water. West of the harbour is a flagstaff, from which a blue flag is displayed when it is dangerous to enter.

LIGHTS.—A white hexagonal iron-framed lighthouse, 46 feet high, stands on the west mole, and exhibits, at an elevation of 45 feet

General charts 1653, 941a, 1263.

Plan of Tegal road on 3311. Var. $0^{\circ} 50' E$.

above high water, a group-occulting white light every thirty seconds, thus:—light, fifteen seconds; eclipse, three seconds; light, three seconds; eclipse, three seconds; light, three seconds; eclipse, three seconds; visible in clear weather 10 miles.

Also a red light on the east mole head, and a green light on the west mole head.

Bank.—Between Tanjong Berebes and Tegal, at a distance of $1\frac{1}{2}$ miles from the shore, there is a bank of $2\frac{3}{4}$ fathoms which extends north-west and south-east for half a mile. From its centre Tanjong Berebes bears 271° true 4 miles, and the lighthouse at Tegal 139° true $4\frac{1}{2}$ miles. In passing along the coast, vessels from the westward should keep outside the depths of 5 or 6 fathoms until Tegal light bears 159° true.

Karang Jeruk or Tegal rock is a coral reef north-eastward of Tegal, about 4 cables in length by 2 in breadth, with a rock on the north side, always above water. From it Tegal light bears 237° true $4\frac{1}{2}$ miles. The rock is steep-to, with 7 to 8 fathoms around; it is marked on its western side by an iron beacon with a black cone. Mid-way between the rock and shore the depths are 4 to 6 fathoms.

Wrecks.—Buoys.—Two miles north of Tegal light is a wreck; it is marked by a green buoy on its eastern side. An obstruction, 2 miles, 14° true, from Tegal lighthouse, is marked by a buoy, painted red with a white horizontal stripe, and the word "Wrak."

Anchorage.—Ships anchor off Tegal (*Lat. $6^{\circ} 51' S$, Long. $109^{\circ} 8' E$* .) to ship cargo, but it is unsafe to do so in the west monsoon. The usual anchorage is with Tegal light bearing from 170° to 215° true, in $2\frac{3}{4}$ to 4 fathoms, mud, one to $1\frac{1}{2}$ miles from the shore.

Chart 1653, Island of Java, western portion.

COAST.—From Tegal the coast runs east, curving gradually north to Tanjong Pemalang, 22 miles east-by-north from Tegal. For 14 miles eastward to Tanjong Sari the coast is thickly populated. Here the main road is close to the shore, and the several hamlets, surrounded by cocoanut trees, are distinctly visible from the offing. The land at the back is mountainous, the most conspicuous elevation being Mount Slamet (Slemat), or Tegal peak, 11,260 feet high, a flat-topped mountain with a conspicuous peak on the north-east side, formed by the edge of the old crater. The crater at present in activity is on the south-west side of the mountain; a thick column of smoke is often seen rising from it. Nearer to the coast are other conspicuous elevations, though none of them of the height of Slamet, which, with the exception of Mount Semeru, is the highest peak in Java. Mount Gajah, 8 miles inland, is an almost bare rock, 1,017 feet high, standing in the middle of a thickly-wooded hill; it resembles a gigantic elephant with its head to the westward (gajah being Malay for elephant). Two

General charts 1653, 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 1° 0' E.

miles east of Gajah are two wooded hills of about the same height, which appear like coffins; and 7 miles east of Gajah is Pemutih hill, 364 feet high. The coast may be approached by the lead, the soundings decreasing gradually.

Tanjong Pemalang (*Lat. 6° 48' S., Long. 109° 29' E.*) is a promontory terminated in a low wooded point, and is formed by the alluvium of the Kwala Chi Omal, which here discharges into the sea. The high trees at the mouth of the river are visible 14 miles from the offing when the rest of the coast is dipped. A bank, which is steep-to, fronts the point, and is said to be extending to the northward; when rounding the point it is advisable to keep in depths of 10 to 12 fathoms $1\frac{1}{2}$ or 2 miles off.

Pemalang and Sugali rocks.—Pemalang rock, a coral patch only half a cable in extent, is 305° true $4\frac{1}{2}$ miles from Tanjong Pemalang; the least depth on it is 3 fathoms, with 11 to 15 around. From it the east side of Mount Gajah is in one with a small wood near Tanjong Sari, 209° true. Sugali rock, a steep-to coral pinnacle, is 9 cables 232° true from Pemalang rock; it is one cable in length east and west, and half a cable broad, the depth being only $2\frac{1}{2}$ fathoms at low water. Around the rock are 11 to 14 fathoms. Passing between these rocks and the shore the depths should not be increased to more than 12 fathoms, whilst outside the depth should not be decreased to less than 17 fathoms; the water is not discoloured.

PEKALONGAN.—From Tanjong Pemalang the coast runs east by south about 13 miles to Pekalongan, and is flat for a considerable distance inland, but its character changes east of Pekalongan. Midway between Tanjong Pemalang and Pekalongan is Kwala Seragi, navigable for boats, with a small cocoanut plantation near the entrance. The town of Pekalongan is 2 miles from the mouth of the Kwala Pekalongan, and is of some importance, possessing a considerable trade in silver, iron, copper, pottery, &c. There are many good stone buildings. The river is guided to the sea between two small piers of masonry. The depth at the entrance is maintained at from 2 to 3 feet by constant dredging, but approach to it is often difficult and even dangerous in both monsoons, at which time a blue flag is hoisted from the flagstaff near the mouth of the river. View at page 110.

Population.—In 1905 the population of Pekalongan was 41,719, including 430 Europeans.

Communication.—The vessels of the Netherlands India Steamship Company call every week.

Supplies.—Good provisions are readily obtained; water is bad.

Anchorage.—The usual anchorage is from three-quarters to a mile off the coast in from 3 to 4 fathoms, muddy bottom, with the

General charts 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 1° 0' E.

lighthouse from 203° true to 159° true. At night the *green* light on the west pierhead must be kept in sight.

LIGHTS (*Lat. 6° 52' S., Long. 109° 41' E.*).—A *white flashing* light showing a flash of *one second* duration *every three seconds* is exhibited, at an elevation of 46 feet above high water, from a white iron frame 46 feet in height, on the west side of the river mouth. It is visible from a distance of 12 miles.

A *red fixed* light is shown on the east mole head, and a *green fixed* light on the west mole head.

Tanjong Gunung.—The low coast continues from Pekalongan to Tanjong Gunung, $6\frac{1}{2}$ miles to the eastward. Here its character changes, Gunung being a rocky point with a broad low hill, on which are groups of tall trees; the highest is 269 feet above the sea. There are two remarkable trees on the coast $1\frac{1}{2}$ miles east of Pekalongan; further east is the mouth of the Kwala Sambong, with a red-roofed house on the left bank, and on the right bank a small but conspicuous group of cocoanut trees.

Tanjong Chelong.—East of Tanjong Gunung a line of densely-wooded hills stretches 8 miles along the coast to Tanjong Chelong, which is high and wooded. The eastern and highest hill is Mount Priksa, 1,204 feet above the level of the sea. Behind this coast range a connected chain of mountains is visible, the most easterly peak, Mount Prahu, being 8,458 feet high, and appearing like a vessel, bottom upwards. North-west of Mount Prahu and close to it there is a remarkable peak 8,386 feet high, whilst further west tower the conspicuous summits of Butak and Langit, 7,287 feet and 5,324 feet high respectively. West of the latter a continuous range joins Mount Slamet. The coast from Tanjong Pemalang to Tanjong Chelong is free from danger, and may be approached by the lead; the depths are 3 to 4 fathoms one mile off-shore.

Tanjong Korowelang.—From Tanjong Chelong the coast curves in a general east-by-north direction to Tanjong Korowelang, which is low and bare and about 4 miles in breadth, with rice fields here and there. The coast range of hills ends 4 miles east of Tanjong Chelong, after which it is again low and flat to Tanjong Korowelang. It may be approached by the lead, the soundings decreasing regularly. Seven miles east of Tanjong Chelong is the broad but shallow mouth of Kwala Kuta; not far from this are a few high trees, the remains of the original jungle. Tanjong Korowelang is formed by the alluvium from the Kwala Brodi (Bodri), which empties by three mouths into the Java sea. Inland in a southerly direction from Tanjong Korowelang are

General charts 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 1° 0' E.

two high peaks named the Brothers. Sendoro (Sindoro), the north-western of the two, is 10,338 feet high, and Sumbing, the south-easterly, is 11,060 feet high. Both are conical in shape, but Sendoro has a flatter top than Sumbing.

Korowelang rock is 3 miles northward of Tanjong Korowelang, being a small reef steep-to, on which the depth is 13 feet, with 10 to 12 fathoms around. There is a good channel between Korowelang rock and the shore, the depths decreasing gradually from 13 fathoms, immediately south of the reef, to the shore; the usual track is, however, north of the rock. The depth is 7 fathoms one mile north of Tanjong Korowelang.

Light-buoy.—A white light-buoy is moored off the northern side of Korowelang rock; it exhibits a *white occulting light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*.

Karang Jahe is a coral patch of 9 fathoms, with 11 to 13 fathoms around, nearly one mile 294° true of Korowelang rock.

Karang Bapang or Corea reef (*Lat. 6° 34' S., Long. 109° 50' E.*).—This reef is situated 26 miles 309° true from Tanjong Korowelang, and 19½ miles 26° true from Pekalongan light; the depth on it is 2 fathoms. It is shaped like a pear with the broad part to the eastward, the major axis being 4 cables and the minor 3 cables. The general depth on the reef is 3¾ to 4½ fathoms, but over the coral boulders there is a depth of only 12 feet, whilst close around the reef the depths are 13 to 19 fathoms, sand and coral; further out at 21 to 25 fathoms, sand and coral. The water over it is frequently discoloured, and in the west monsoon the sea is rough in the vicinity. From the reef the high trees at Tanjong Gunung can be distinguished, as well as Mount Priksa and the mountains at the back, Priksa being in line with the intersections of the slopes of Mounts Sumbing and Sendoro.

Coast.—From Tanjong Korowelang the coast runs in a general east-south-easterly direction for 15 miles to Semarang. Between Tanjong Korowelang and Kwala Kendal, 4 miles to the eastward, there is a cocoanut plantation and the village of Bododo. The depth in the entrance of Kwala Kendal is 3 feet. Eastward of it are two small rivers, Wungu and Karang Anjer, with clumps of cocoa-palms on the coast. At the back of the coast, which is low, is Mount Ungaran, 6,725 feet high.

Plan of Semarang bay on 932.

SEMARANG, the capital of Mid-Java, is a long straggling town on either side of Semarang river, with some handsome buildings, and a population in 1905 of 96,660, including 5,126 Europeans. The town is separated from the sea by a low marsh from half a mile to

General charts 1653, 941a, 1263.

Plan of Semarang bay on 932. Var. 1° 10' E.

one mile in width, but to the east and west of it are extensive level plains well cultivated and traversed by canals. The land rises rapidly southward of the town. Semarang possesses considerable trade, although the roadstead is open and unprotected from westerly winds. Loading and discharging is by praus of 4 to 60 tons.

Landmarks.—The most conspicuous marks on shore for recognising the place are the lighthouse, a tomb with a cupola on Moloyok (Melaya) hill, Klajaran (Kalayaran) beacon near Kwala Pechankringan east of the town, and the water tower of Chandi.

Canal.—Below the town of Semarang, the river is canalled, and conducted seaward by piers, the western projecting half a mile beyond high-water line, and the eastern 3 cables, into 9 feet water. When approach is dangerous, a blue flag is hoisted on the flagstaff near the lighthouse; and vessels may communicate, by the International code, with a signal station on the town hotel.

In the western monsoon, the current runs strongly to the eastward across the mouth of the canal.

An inner harbour is to be constructed near the mouth of the canal, with a separate basin for native fishing boats. The Customs buildings will be erected there, and it will be connected by railway and tramway with the existing systems. The western pier is to be lengthened by about 430 yards.

LIGHTS (*Lat. 6° 57' S., Long. 110° 25' E.*).—From a white iron lighthouse 115 feet high, on the beach on the western side of the inner part of the piers, is exhibited, 107 feet above high water, a *white flashing light every half-minute*, visible in clear weather 16 miles. The flash is of *four seconds'* duration.

At the extremity of the eastern mole a *green* light is shown, and from the end of the western mole a *red* light, to guide boats into the canal. During the westerly monsoon, from 1st November to 1st April, the *red* light is moved inwards 355 yards, and is then opposite the *green* light on the east mole.

Anchorage.—Semarang bay affords good holding ground, but is entirely open from north-north-east to west. The usual anchorage for large ships is in 5 to 6 fathoms, about 3 miles off-shore. Small vessels may anchor about a mile from the west pierhead in 3 to 4 fathoms.

In the western monsoon a heavy sea sometimes rolls in, and communication with the shore may be interrupted for several days together.

The limit of the port of Semarang is, to westward, the tomb on Moloyok hill, 180° true; and to eastward, Klajaran beacon, 117° true; the outer limit being the contour line of 5 fathoms.

General charts 1653, 941a, 1263.

Plan of Semarang bay on 932. Var. 1° 10' E.

Wrecks and buoys.—There are two sunken wrecks in Semarang road, in the following positions:—

At a distance of $2\frac{1}{4}$ miles, 343° true from Semarang lighthouse (Lat. $6^\circ 57'$ S., Long. $110^\circ 25'$ E.), marked by a buoy, painted red with a white horizontal stripe and surmounted by a ball. About three-quarters of a mile eastward of this buoy is a green light-buoy exhibiting a *white occulting* light *every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*.

At a distance of $1\frac{9}{10}$ miles, 353° true, from Semarang lighthouse, marked by a buoy with red and white horizontal stripes, and staff and ball.

Tide.—In the middle of June it is high water at noon, and in the middle of December at midnight; spring range is $2\frac{3}{4}$ feet. (*See page 13.*)

Supplies.—Provisions are plentiful. Water is carried off in native boats. About 1,000 tons of coal and a considerable quantity of liquid fuel are usually stored. Considerable repairs can be made to engines and boilers; castings made, and shaftings turned. There is a 25-ton crane.

Tugs can be engaged for local services.

Hospital.—There is a military hospital to which seamen can be admitted.

Shipping.—In 1912, 36 steam vessels of 69,735 tons entered the port. Of these, 23 steam vessels, of 52,589 tons, were British.

Communications.—Semarang is connected by railway with Surakarta in the interior, from whence lines branch off to Surabaya to the eastward, and to Chilachap on the south coast, and thence to Batavia. A line connects Cheribon to Semarang, and there is a steam tramway to Juana. There is both telegraphic and telephonic communication with Batavia and Surabaya; the great post road from Batavia to Surabaya also passes through Semarang. The Netherlands India Company's steam vessels call twice a week, as well as other steam vessels.

Winds.—The mean direction of the wind is, from April to September, at 9 a.m., 130° true; 2 p.m., 76° true; 6 p.m., 8° true. From October to March at the same hours, 125° true; 330° true; 290° true.

General charts 1653, 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 1° 10' E.

Coast.—From Semarang the coast trends in a north-easterly direction to Tanjung Teluk Aur, a distance of 24 miles. The shore is low, and covered with a monotonous line of small trees, and the country within is flat for a considerable distance, so that in clear weather Mount Lawu, 10,676 feet high, can be seen, although 60 miles from the coast. In-shore to the eastward of Japara is Mount Sutorengo, 5,233 feet high, and north of it Mount Genuk, 2,339 feet high; these mountains appear as islands from Semarang bay. Between Semarang and Teluk Aur a number of small rivers discharge into the sea, but they are mostly useless for navigation; the Torbaya, immediately east of Semarang, is navigable for praus a short distance; the Demak has one foot of water on the bar at low water; and further north is the Tangul Angin, the largest stream on this part of the coast.

From Teluk Aur to Mandalike the character of the coast entirely changes, being rocky and irregular with sharply projecting points, with several creeks between. A fringe reef projects half a mile from the coast in places, but there are no dangers except round Visschers and Panjang islands, and the coast may be safely passed at a distance of from one to 2 miles. Close in bottom is soft grey mud, further out blue mud and black sand. The coast eastward of Japara is uninhabited, being covered with dense forests, and rising rapidly to the mountains.

Plan of Japara road on 932.

Tanjung Teluk Aur, the south point of Japara bay, is rocky, and bordered by a reef projecting from one to 4 cables into a depth of 2 fathoms. On the north-west side of the reef there are rocks above water; southward of the point the shore is sandy, with rocks here and there. Coconut palms grow near the point.

Visschers island (*Lat. 6° 37' S., Long. 110° 35' E.*), 2 miles 248° true from Tanjung Teluk Aur, is a cluster of bare rocks of a grey colour packed close together, with a greatest diameter of 13 yards, and standing 5 feet above high water. It is surrounded by a reef which extends from three-quarters of a cable to 3 cables from the rock, round which the depths are 5 to 6 fathoms. The depth decreases from this reef to that projecting from Teluk Aur, and at one mile from the shore is 3 fathoms.

JAPARA ROAD.—Between Tanjongs Teluk Aur and Kuniran, which are north and south nearly 4 miles apart, is a shallow bay, with the islands of Kelor and Panjang extending off 2 miles from the centre. Japara road, that part of the bay northward of the islands, is well sheltered in the eastern but exposed and unsafe in the western monsoon. There is no export, and the place is seldom visited.

General charts 1653, 941a, 1263.

Plan of Japara road on 932. Var. 1° 10' E.

Japara, the chief town of the Residency, is half a mile inland on the banks of the Kwala Japara, opposite Kelor island. Very little of the town can be seen from the road, but the fishing village at the mouth of the river is readily distinguished, also the Harbour Master's office with a white flagstaff 3 cables inland. The village of Sekembu stands on the shore one mile north of the entrance of the river.

The population of Japara, in 1905, was 10,401, including 84 Europeans.

Light.—A *fixed white* lantern light is exhibited on the south side of the entrance to Kwala Japara.

Tanjong Kuniran, the northern point of Japara road, is a low flat spit of coral and sand, covered with brushwood, with a reef projecting 2 or 3 cables from it, partly dry at high water. This reef continues round the shore of Japara bay to a distance of one cable. The point may readily be distinguished by a group of cocoa-palms about 4 cables inland.

Panjang island (*Lat. 6° 34' S., Long. 110° 37' E.*), south-west of Tanjong Kuniran, is covered with palms, and can be sighted at a distance of 10 miles, standing out as a long low strip of land, darker than that behind it. It is 4 cables long and 2 cables wide, and is bordered on all sides by a reef which projects nearly 2 cables to the north-west, partly dry at half-tide; outside the reef the depth is 5 to 6 fathoms. Near the south-east point is a white sandy beach convenient for landing.

Kelor is 125° true from Panjang island, and within the 3-fathoms contour line of Japara bay; its south-east point is 164 yards from a point on the mainland, and between these points there is only one foot of water at low tide. The island is 6 cables long, north-west and south-east, and 3 cables wide; a reef projects 3 cables from the north side and 1½ cables from the west and south sides. The island generally is covered with palms, but on its south-east point is low brushwood. There is a village on the south-west side, and some limekilns.

Between Panjang and Kelor there is a channel 4 cables wide in which the depths are from 4 to 5 fathoms. The best track is near Panjang, passing the south point at not less than 2 cables distant.

Anchorage.—The principal entrance to Japara road, between Tanjong Kuniran and Panjang, is one mile wide, with depths of 3½ to 5 fathoms. Japara flagstaff bearing 130° true will lead in mid-channel, and small vessels may anchor in about 3½ fathoms, when the west point of Kelor is in line with Tanjong Teluk Aur 189° true,

General charts 1653, 941a, 1263.

Plan of Japara road on 932. Var. 1° 10' E.

one mile from the mouth of Kwala Japara, and nearly 4 cables from the reef round Kelor island.

COAST.—Tanjong Tumpuk, one mile north-east of Tanjong Kuniran, is low, rocky, and wooded. A reef extends 3 cables from it. Between Tanjongs Tumpuk and Kuniran there is a bay with a white sandy beach.

Tanjong Sependok, one mile north-east of Tanjong Tumpuk, resembles it in character, with a reef extending $1\frac{3}{4}$ cables off; the Kwala Barus empties itself between Tanjongs Sependok and Tumpuk.

Tanjong Piring, $1\frac{1}{2}$ miles northward of Tanjong Sependok, is low and flat and overgrown with brushwood, with a conspicuous clump of taller trees inland. It is formed of rocks with sand and coral, and has a white sandy beach on which are some conspicuous black rocks. A reef with 3 fathoms at the edge projects $2\frac{1}{2}$ cables from it. Outside this reef the depth increases rapidly. Between Tanjongs Sependok and Piring there is a bay with a white sandy beach, into which the Kwala Melongo discharges.

Chart 1653, Island of Java, western portion.

Karang Ombo is a small bank of $4\frac{3}{4}$ fathoms, $1\frac{1}{2}$ miles northward of Tanjong Piring; it is 3 cables in length and $1\frac{1}{2}$ in breadth, with 8 to $9\frac{1}{2}$ fathoms, mud, around; from the bank Mandalike light is obscured.

Tanjong Jati (*Lat. 6° 27' S., Long. 110° 43' E.*) is a round promontory 5 miles north-east of Tanjong Piring. A wood of tall trees reaches close to the high sandy beach near Tanjong Jati, and a rocky reef projects one cable from it. Outside the reef the depth of water increases rapidly, so that the point may be rounded at a moderate distance.

Tanah Merah is, as the name indicates, a red promontory, $4\frac{1}{2}$ miles east of Tanjong Jati. Its appearance is that of a conspicuous steep rock, the crest being crowned with dark trees. A reef extends off this coast for half a cable.

Tanjong Tular.—About 6 miles east of Tanah Merah the Chilering mountains terminate in Tanjong Tular, between which and Tanah Merah are two other points named Merichan and Woluh. A sandy beach lines the creeks between the two points, and off this part of the coast are isolated rocks, the outermost, $3\frac{1}{4}$ cables north-west from Tanjong Tular, is 100 feet in extent, and almost awash.

Tanjong Beteng, opposite Mandalike island, has a round hill on it named Belinderan, 167 feet high, the site of an old fort which formerly served as a defence from pirates established on Mandalike

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Chart 1653, Island of Java, western portion. Var. 1° 10' E.

island. There is another hill, Gua Manik, 212 feet high, between Tanjongs Tular and Beteng; both hills are conspicuous when coming from the westward. Off the point there is a rock with one foot water.

All along the coast from Jati to Beteng there are fresh-water brooks cut off from sea in the dry season by sandy beach, but which increase to little mountain torrents in the rainy season, and then break down the sandy barrier, and empty their pure fresh water into the sea.

MANDALIKE, $1\frac{1}{2}$ miles 6° true from Tanjong Beteng, is $3\frac{1}{2}$ cables long in a north-easterly direction, and 2 cables wide, being elevated 240 feet above high water, with trees 60 feet in height; it is visible at a distance of 20 miles. There is a fringing reef half a cable in extent off the south-west and south sides of the island, and on the south-east side a shoal of sand and shells extends $3\frac{1}{4}$ cables. The other parts are steep-to with 4 to 5 fathoms close to the island. Near the south-west point is a mole of stones for convenience of landing. In the narrow channel between Mandalike and Tanjong Beteng there are depths of 4 to $4\frac{1}{2}$ fathoms. The track for vessels is north of the island.

LIGHT (*Lat. $6^\circ 23' S.$, Long. $110^\circ 55' E.$*).—On the summit of Mandalike island there is a white iron open frame lighthouse, 51 feet high, from which is exhibited a *group flashing white light every twenty seconds*, showing *two flashes of two seconds each; eclipse between flashes two seconds, between groups fourteen seconds*. The light is 280 feet above the sea, and is visible in clear weather 23 miles. For the arc of visibility, *see* Light list.

Mountains.—On the mainland opposite Mandalike are Muria or Japara mountains, about 12 miles from the coast; they consist of a number of peaks, giving the range a rugged appearance; the highest and most conspicuous is Sutorengo, 5,233 feet high, being sharp on a south-west bearing, but appearing as a truncated cone when bearing south-east. The south-westerly peak of the range is Rahtau (Retawu), 4,977 feet high. Northward and closer to the coast lies the Chilering chain, well wooded, and with a rugged outline. The highest is named Genuk, 2,339 feet high; the other peaks are lower. Two of them, Gua Manik and Belinderan, have been already mentioned; 3 miles east of Belinderan is Mount Bako, 581 feet high, and half a mile southward of the latter is Mount Ragas, 453 feet high; and Belum-bung, of 692 feet, rises $1\frac{1}{2}$ miles south of Ragas.

KRIMON JAVA ISLANDS.—North-west 37 miles from Mandalike island is Krimon Java archipelago, consisting of 25 islands between the parallels of $5^\circ 43'$ and $5^\circ 55'$ South latitude, and the meridians of $110^\circ 6'$ and $110^\circ 37'$ East longitude.

General charts 941a, 1263.

Chart 1653, Island of Java, western portion. Var. 1° 10' E.

Krimon Java and Komodian islands.—These are the largest of the group, separated by only a narrow channel in which the depth at low water is barely one foot. Krimon (Karimun) is high, rocky, and covered with trees; its highest peak attains an elevation of 1,660 feet above high water, and spurs branch off to the various points of the island, which are mostly composed of large stones with sandy beaches between the points. The only piece of level land is at Tanjong Benteng, the south-west point of the island. Here is a village, and here also stands the dwelling of the Dutch Resident, with a flagstaff in front (*Lat. 5° 53' S., Long. 110° 26' E.*). Komodian (Kemudian) is flat and evenly wooded, with only one hill, 374 feet high, near the south point. Some of its points are high and rocky, from 60 to 100 feet above high water. Between the points there are sandy beaches. The two islands together are 9 miles in length and 5 miles in breadth, and are surrounded by a coral reef, which in places extends nearly a mile from the shore. Near the south-east side of Krimon is Batu island, and Merichan island is on the west side of Komodian.

Plan of Krimon Java road on 3311.

Menjangan islands.—Near the south-west point of Krimon are two islets, covered with cocoanut palms, named Menjangan Besar and Menjangan Kechil. They are surrounded by extensive coral reefs, on which many rocks dry at low water; outside the reefs the depth is from 16 to 23 fathoms.

Between the reefs from Menjangan and those from Krimon there is a channel from a half to one cable in width, beacons by stakes for praus; and between the two Menjangan islands there is a channel $1\frac{1}{2}$ cables wide fit for praus.

Chart 1653, Island of Java, western portion.

Sintok, Tenga, and Kechil are three small islets covered with cocoanut and casuarina trees, to the eastward of Komodian. They lie in a north and south direction from each other, and are surrounded by reefs, close to which the depths are 10 to 20 fathoms.

Gusong Batu Putih, south-west of Sintok, and midway between that islet and Komodian, is a rock one cable in diameter, with $1\frac{1}{2}$ feet over it at low water and 13 fathoms around.

Gusong Tenga is a coral reef $3\frac{1}{2}$ cables in length and 2 cables in breadth between the islets of Sintok and Tenga. On its north part there is a rock always uncovered. Between Gusong Tenga and Tenga island is another coral patch nearly dry, and one of 5 fathoms lies 105° true from Kechil islet, distant half a mile.

Karang Kakamonchang.—Outside the reef fringing Komodian are other reefs which close the passage between Komodian

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Chart 1653, Island of Java, western portion. Var. 1° 10' E.

and the three islets of Sintok, Tenga, and Kechil. The most southerly reef is Karang Kakamonchang, $1\frac{1}{2}$ cables in diameter with one foot over it. From it Tanjong Gemok bears 308° true a little over half a mile.

Chendikian and Gundul, one mile 68° true from each other, are the north-eastern islets of the Krimon Java group. They are 3 miles 77° true from Tenga islet. Chendikian is low and covered with low trees for the most part, but also some casuarina trees. It is two-thirds of a mile long, $1\frac{1}{2}$ cables wide, and is surrounded by a coral reef which extends half a mile from the north-east point, but only half a cable from the south point. Close to the reef the depths are 10 to 21 fathoms.

Gundul (*Lat. $5^\circ 47'$ S., Long. $110^\circ 34'$ E.*) is a mass of rock 148 feet high, almost bare, being but scantily covered with low brushwood. It is $1\frac{1}{2}$ cables long and three-quarters of a cable wide, surrounded by a fringing reef one-quarter of a cable broad, close to which the depths are 22 to 25 fathoms, sand.

Between the reefs surrounding these islands the depth is 22 fathoms, sand.

Genting, Seruni, and Sambangan.—These are the south-eastern islets of the Krimon group, 3 miles 159° true from Chendikian and Gundul, and 6 miles eastward of Krimon island. Genting is $1\frac{3}{4}$ miles in length north and south and 4 cables wide; there are several hills on the east side; the highest is 328 feet high. The islet is covered with trees and surrounded by a coral reef which extends $4\frac{1}{2}$ cables on the north side, and is connected with the reef round Sambangan.

Sambangan and Seruni islets, west of Genting, are north and south, nearly one mile apart. Both are low, with cocoanut trees and brushwood growing on them; the former is $3\frac{1}{2}$ cables long east and west and $1\frac{3}{4}$ cables wide, and the latter is half a mile long in a north-west direction and $2\frac{1}{4}$ cables wide. Both are surrounded by coral reefs which extend here and there half a mile from the shore. There are several detached reefs about and between the islets, and outside the depths are 20 to 25 fathoms, sand, to the southward; mud elsewhere.

Keleang (Gelean) and Burung are 3 miles west of Menjangan Kechil, and lie 40° true from each other a little over three-quarters of a mile. Keleang is half a mile long and nearly 3 cables wide, and is covered with cocoanut trees. Burung is one cable in

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Chart 1653, Island of Java. Var. 1° 10' E.

diameter and has high trees. Both are flat and surrounded by fringing reefs which project nearly 3 cables, close to which the depths are 15 to 20 fathoms, sand, whilst between the islands the depth is 15 to 21 fathoms, sand.

Menjawakan and Chemara are three low islets north-west of Krimon. Menjawakan, the largest, is 4 cables long in a north-east direction and $1\frac{1}{2}$ cables wide. All are surrounded by reefs which extend 3 cables from Menjawakan and Chemara Kechil, but one mile from the north-east side of Chemara Besar; and a detached shoal of 2 fathoms is about 80° true 3 cables from the north point of Chemara Besar, whilst south-east of Chemara Kechil, just outside the fringing reef, is a rock with 3 feet at low water. In the channels between Menjawakan and Chemara islets the depth is 19 to 25 fathoms.

Gusong Chemara is a reef half a mile north-east of Chemara Kechil with a sandy cay on its north side. It is 2 cables in extent. A patch of 7 fathoms, named Taka Bimbang, lies 23° true 4 cables from this reef.

Pearl reef (Taka Menjawakan) (*Lat. 5° 46' S., Long. 110° 19' E.*), 2 miles north-westward of Menjawakan islet, is 2 cables long east and west, and half a cable wide, with one fathom least water.

Bengkuang, 4 miles north-west of Komodian, is about a mile in length by half a mile wide; wooded, and surrounded by a coral reef which extends nearly a mile to the eastward of the isle, but only half a mile on the other sides; outside the reef the water deepens rapidly to 20 fathoms.

Parang, 9 miles westward of Bengkuang, is nearly 2 miles long, north and south, the northern part is rocky and 262 feet high; the southern part is low and has a village on it. A little islet, Kumbang, lies on the reef south-west of Parang; both islets are wooded. The reef that surrounds these islands is one cable wide north of Parang, but extends to $1\frac{1}{4}$ miles to the south-west. Four small reefs lie close-to on the south-east side.

Gusong Kumbang is a dry sandbank on a reef about 3 cables long and 2 cables wide, $2\frac{1}{2}$ miles 159° true from Parang.

Kembar, the north-westernmost islet of the group, and $2\frac{1}{2}$ miles westward of Parang, is about a mile long by 2 cables wide, and covered with bushes; it is encircled by a reef, which extends a mile northward, and a third of a mile southward of the island. On the north end of the reef is a dry sandbank.

Gusong Selikur is a dry sandbank on a coral reef about a mile north-east of Kembar; the reef is three-quarters of a mile long and 3 cables wide.

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Chart 1653, Island of Java. Var. 1° 10' E.

Katang and Nyamuk, south of Kembar, are small wooded islands surrounded by reefs; that round Katang is of no great extent, but the Nyamuk reef extends one mile eastward, and 2 miles westward of the island.

Karang Katang is the extensive coral reef, west and north of Katang islet; it is 3 miles long in the north-east direction, and about 2 miles wide, steep-to with 20 fathoms water near the outer edge. On the northern part, Karang Besi, there is a dry sandbank, and on the southern part there are two dry sandbanks.

Kerakal islets.—The greater of these two islets lies about 4 miles south of Parang, and the lesser lies three-quarters of a mile south-south-west of the greater. Both are wooded and surrounded by reefs a third of a mile wide.

Karang Kapal (*Lat. 5° 54' S., Long. 110° 13' E.*), an extensive reef $1\frac{1}{2}$ miles south of Kerakal kechil, is $1\frac{1}{2}$ miles long east and west, by one mile wide, and is composed of coral rock partly dry at low water, steep-to, with soundings of 11 to 25 fathoms at a short distance.

Passages between the islands.—Eastward of Krimon and Komodian, between the islands Sintok, Tenga, and Kechil on the one hand and the islands Chendikian and Gundul on the other, the passage is clear with depths of 17 to 23 fathoms. Westward of Krimon, between that island and Keleang and Chemara, the passage has 16 to 20 fathoms. Between Menjawakan and Keleang on the one hand and the Kerakal islets on the other there is a wide passage in which, however, care must be taken to avoid Pearl reef and Gusong Kumbang; the first of these is dangerous as it can only be seen when close to it. To clear this reef when passing eastward of Parang, Gusong Kumbang should be kept in line with Kerakal islets. Between Kembar and Parang northward, Nyamuk and Karang Besi southward, the passage is clear with soundings of 23 to 28 fathoms, muddy bottom. Between Nyamuk and Kerakal islands the passage is also clear with 25 fathoms in mid-channel. The reefs surrounding the islands can, as a rule, be readily seen by the discolouration of the water.

Plan of Krimon Java road on 3311.

Krimon Java road.—During the easterly monsoon there is good anchorage on the south-west side of Krimon island. To make the anchorage a vessel should pass west of Menjangan Kechil, and when the small white house near the village on Tanjong Beteng is in line with a remarkable clump of trees near Tanjong Puduk, about 114° true, steer in for the road, passing the northern reefs off Menjangan Kechil at a

General charts 941a, 1263.

Plan of Krimon Java road on 3311. Var. 1° 10' E.

distance of nearly 2 cables, and when Bengkuang island is on with Tanjong Gelam, bearing 0° true, anchor in 15 fathoms, sandy bottom. It is not recommended to go closer in without the assistance of a native pilot, because of many hidden patches of coral.

In the westerly monsoon there is fair anchorage in 17 fathoms in the south part of the channel between Menjangan Besar and Krimon, with the flagstaff bearing 318° true, and Tanjong Puduk 68° true.

Tides at Krimon Java are diurnal; in June it is high water about VIIIh.; springs rise 6 feet, neaps 5 feet.

Chart 1653, Island of Java, western portion.

Sverre reef (Lat. 6° 2' S., Long. 110° 21' E.), of 2½ fathoms water, 9 miles 203° true from the south point of Krimon island, is 380 yards long by 240 yards wide, and consists of broken coral and sand. The shoalest part is on the south-west end, and can usually be distinctly seen by the light colour of the reef and surrounding water.

Charts 1653, 1654, Island of Java.

COAST OF JAVA.—From Tanjong Beteng, opposite Mandalike island, the low, flat coast runs 96° true for 8 miles as far as Tanjong Janom; it here turns abruptly southward for 16 miles to Kwala Juana, and then eastward, forming a wide bight terminating in Tanjong Bendoh, 30 miles 114° true from Tanjong Janom. The western shore of this bight is fronted by Bugel bank, and along the southern shore, between Kwala Juana and Tanjong Bendoh, there lie several islets and reefs. Numerous fish-ponds are formed on the flats between Tanjong Bugel and Kwala Juana. The bottom shelves gradually outwards, and vessels making Juana or Rembang roads cannot approach near enough to make out the low coast. Mount Nlangu, 1,388 feet high, which lies 15 miles south of Juana, and Mounts Butak and Lasem south of Tanjong Bendoh are useful marks; the mountains further inland are seldom discernible.

Soundings.—Along the whole coast, from Mandalike island to Tanjong Panka—at the entrance of Surabaya strait—the bottom is very shelving between the projecting points, but outside the depth increases more rapidly, and at a distance of 2 miles from the points there is generally 10 fathoms. Near the shore the bottom consists of grey mud, further out of blue mud and black sand mixed with broken shells over a heavy clay.

Tanjongs Janom and Bugel are low and difficult to recognise from seaward, especially as vessels must keep at a distance to avoid Bugel bank.

General charts 941a, 1263.

Chart 1654, Island of Java, eastern portion. Var. 1° 20' E.

Bugel or Tayu bank is an extensive flat, which, starting from the foot of Mount Genuk opposite Mandalike island, circles round Tanjongs Janom and Bugel, and follows the coast to Tanjong Bendoh. At 4 miles north of Tanjong Janom the depth is 3 fathoms on the edge of the bank, whence it falls abruptly to 10 fathoms; from this northern edge Mandalike island bears 260° true, vessels should therefore not bring Mandalike to bear west of 248° true.

Plan of Juana and Rembang roads on 934.

Kwala Juana is about one cable wide and 2 to 3 fathoms deep, but is fronted by a mud bar through which there is only a narrow channel of one foot depth at low water. The entrance of this channel is marked by a wooden beacon surmounted by a white ball, and further in the fairway by smaller beacons. Coast marks are Gedeh and Marungan islands, covered with trees, Tanjong Bendoh, and the factory chimney westward of the town; also a remarkable tree on the right bank showing dark foliage against the lighter green of the trees beyond; this tree comes on with a watch-tower near Juana town on the bearing 220° true.

Juana town is about 2 miles up from the entrance of the river, and can be seen from the road. It is the seat of the Assistant Resident of the province, and is connected with Semarang by a steam tramway. Provisions are procurable at high prices, but water can only be obtained with difficulty from some distance up the river.

LIGHT (Lat. 6° 42' S., Long. 111° 9' E.).—A *white flashing* light, showing a flash of *one second* duration *every three seconds*, is exhibited at an elevation of 82 feet above high water, from a white iron framework 78 feet in height situated near the harbour office, Juana town. It is visible from a distance of 14 miles.

A *white fixed* light is exhibited, at an elevation of 24 feet above high water, from a post situated 197 yards up the right bank of the Kwala Juana.

Laut reef, a mile north-west of the entrance to Kwala Juana, is about 2 cables in length; it dries at low water and has about 1½ fathoms water around it.

Juana reef (Pulo Payu) is 2 miles east of the river and 2 miles from the shore; it partly dries at low water and is surrounded by depths of 2 fathoms.

Marungan islet, 5 miles east of Kwala Juana, is a small islet covered with cocoanut palms, and surrounded by a reef which extends one-third of a mile to the northward and dries at low water. Close to the reef the depth is 2½ fathoms. Native praus find shelter on the

General charts 1654, 941a, 1263.

Plan of Juana and Rembang roads on 93½. Var. 1° 20' E.

south-east side of the island during the west monsoon. A small reef, Gondoh, lies 2 cables west of Marungan islet.

Penowo, 2 cables in diameter, 1½ miles 12° true from Marungan islet, dries at low water, and is surrounded by depths of 3 to 4 fathoms.

Anchorage.—There is anchorage in 4 fathoms with the mouth of Kwala Juana bearing 226° true, distant 6 miles. Coast marks are not easily seen at this distance with the exception of the trees on Marungan islet, and the ship's position must be determined by the lead. Marungan islet should not be brought to bear southward of 170° true, to avoid Penowo.

Rembang roads.—Eastward of Marungan islet are islets, reefs, and foul ground; the outermost only of these will be described.

Gedeh islet is about the same size as Marungan, covered with brushwood and a few tall trees, and is surrounded by a reef which extends about 2 cables to the eastward and dries at low water; the depth close to the reef is 4 fathoms.

Chilik islet and Wen Wen reef.—Chilik is a low islet covered with brushwood half a mile south-east of Gedeh; it is surrounded by a narrow reef. Wen Wen reef, 3 cables east of Chilik islet, partly dries at low water, and has 3 fathoms at the edge.

Masaran islet, half a mile south-east of Wen Wen reef, is a sand cay on a reef which partly dries at low water, with 3 fathoms at the edge.

Gurian reef, one mile north-east of Rembang town, is 2 cables in diameter, and dries at low water.

Sualang islet, 1½ miles 74° true from Gurian reef, and one mile from the shore; is rocky and surrounded by a reef of 2 cables width.

Gusong bank, 3½ miles 57° true from Sualang islet and 1½ miles from shore, is a small sandbank, dry at low water and partly visible at high water, with 5 fathoms around. The bank is in line with a remarkable solitary tree on one of the western slopes of the Lasem mountains, bearing 159° true.

Rembang (*Lat. 6° 43' S., Long. 111° 20' E.*), the chief town of the Residency, stands on the bank of the little Kwala Gedang, which can only be entered by boats at high water. The beach in front of the town cannot be approached by boats near enough for landing even at high water. The town may be recognised from seaward by the white buildings with red roofs of the Residency and club-house.

Population.—In 1905 the population was 13,289, including 171 Europeans.

General charts 165½, 941a, 1263.

Plan of Juana and Rembang roads on 934. Var. $1^{\circ} 30'$ E.

Supplies.—Fresh meat, vegetables, and fruit, can always be obtained. During the west monsoon rain water is collected in tanks, but only small quantities can be obtained by special permission from the Resident.

Anchorage.—Vessels can anchor with the Residency flagstaff bearing 181° true, in the depth of water suitable to draught; the bottom is soft mud.

Tanjong Bendoh is low and bare of vegetation, steep-to, and bordered by a coral reef a cable wide. Tanjong Pelabuhan, immediately east of Tanjong Bendoh, is rocky; it is formed by a spur of Lasem mountains.

Chart 1654, Island of Java, eastern portion.

Tanjong Aur Aur (Lat. $6^{\circ} 45'$ S., Long. $111^{\circ} 57'$ E.), 29 miles 105° true from Tanjong Bendoh, is low, but may easily be distinguished by the hill Kalak Wilis, 335 feet high, $4\frac{1}{2}$ miles 169° true from the point. Between Tanjongs Pelabuhan and Aur Aur the shore is bordered by a sand beach; within the 3-fathoms line there are rocks, and less water than is shown on the chart is reported to exist on a line joining Tanjongs Petokol and Aur Aur.

Shoal.—A shoal, with a depth of $2\frac{3}{4}$ fathoms over it, is situated 4 miles to the eastward of Tanjong Petokol, and 2 miles off-shore.

Coast.—From Tanjong Aur Aur the coast trends eastward 39 miles to Ujong Panka at the entrance of Surabaya strait, and is low with only two noticeable points, Kodok and Pakis; and except at those points which are rocky, it is fringed by a sand beach and narrow reef a cable wide. The depth of water increases gradually to seaward, and at 5 or 6 miles from the coast is 10 fathoms; within the 3-fathoms line it is rocky. Fishing villages are on the coast, but no town of importance except Tuban.

Plan of Tuban road on 3311.

Tuban road is at the head of the bight between Tanjongs Aur Aur and Kodok, 10 miles south-east of the former. There is open anchorage, in $3\frac{1}{2}$ fathoms, with the flagstaff bearing 203° true, distant $1\frac{1}{2}$ miles.

Supplies.—Meat of good quality can be obtained, but no vegetables. There is excellent water for drinking purposes.

Plan of Surabaya strait on 934.

Ujong Panka, at the northern entrance to Surabaya strait, is low and not easily distinguished, but the village of the same name, a

General charts 1654, 941a, 941b, 1263.

Plan of Surabaya strait on 934. Var. 1° 30' E.

mile westward, shows well against the cocoa-palms behind. Four miles westward of the point are two bare flat-top hills, named Doodkisten (coffins), the northern, Banjulegi, is 420 feet high, and the southern, Gosari, 360 feet. View on plan 234. On Banjulegi is a small white pyramid, which may be seen in clear weather 12 miles; and on Gosari are a few trees. Two miles further west is Malang, of 459 feet, with a square flat top. These hills are good marks for recognising Ujong Panka, and in the north-western monsoon it is advisable to sight them before nightfall, as the current carries a ship speedily to the eastward.

The mudbank on the west side of the strait is continually extending, due to large deposits from Sungai Solo, and in 1911 the 3-fathoms line was $3\frac{1}{2}$ miles north from the village a mile west of Ujong Panka; westward of this the shallow water trends in towards the land.

Light-buoy.—A white light-buoy, marking the northern edge of the bank off Ujong Panka, is moored $5\frac{1}{10}$ miles, 32° true, from the pyramid on Banjulegi hill. It exhibits a *white occulting light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*.

SURABAYA STRAIT.—The northern entrance between Ujong Panka and Tanjong Modung, the north-western point of Madura, is 15 miles wide, but this space is almost entirely occupied by an extensive shoal-flat, called Zee bank. The general direction of the strait for 18 miles to Grisee, is south; it then turns eastward for 6 miles, and unites with Madura strait some 2 miles beyond Surabaya.

The shores on both sides, from Ujong Panka and Tanjong Modung, converge towards Ujong Piring (*Lat. $7^\circ 2' S.$, Long. $112^\circ 41' E.$*), where, 10 miles south of the northern edge of Zee bank, the width between the high-water lines is but $1\frac{1}{2}$ miles.

Through the bank there are three passages which unite 4 miles from Ujong Piring, forming from there a broad and deep channel to Surabaya. Of these passages only the eastern is buoyed and lighted; the direction from seaward is 200° true. The two western passages, which are little more than slight depressions in the bank, have depths of 9 and 6 feet, and they are both obstructed by fishing stakes.

Depths.—On the bar of North channel, with the leading light-houses in line, there are $20\frac{1}{2}$ feet at low water springs. Ships, however, with sufficient engine-power and with draughts which exceed the depth up to 3 feet, go without danger through the mud. The channel has been dredged to a breadth of 76 yards.

General charts 1654, 941b, 2759a.

Plan of Surabaya strait on 934. Var. 1° 30' E.

Tide tables for the whole year, which give the depths for every hour, can be obtained from the harbour offices at Batavia and Surabaya.

Sungi Solo, by an artificial cut made to divert from the channel of the strait the immense deposits of alluvium brought from the interior, runs nearly due north and discharges immediately east of Ujong Panka, forming there the constantly increasing bank before mentioned. Five miles within the mouth the depth has gradually increased to 30 feet, and at the village of Kapala there is a landing wharf and a good road to the town of Sidayu.

Western side of the strait.—From the mouth of Sungi Solo the low coast trends south-east to the old, but now closed mouth of the river; then southward 2 miles to the abandoned Fort Erfprins, still distinguished by a few round-topped trees standing out against the low ground beyond, and 2 miles more in the same direction to Tanjong Sau. A dark growth of bamboos marks this point, and a mile north-west are three trees, the centre one and tallest, known as Menari tree, is conspicuous from northward. Off all this part of the shore there is a broad bank of soft mud ending at Tanjong Sau, the eastern edge, forming the west side of the ship channel, is very steep-to and in places is of hard sand.

From Tanjong Sau to Grisee, 6 miles to the southward, the low thickly vegetated coast between, with many fish-ponds, recedes, forming a bay entirely filled with a bank of mud and sand. Through the middle of this bank the channel of the Kwala Miring is led, between strong screens of bamboo, and maintains a depth of 5 to 8 feet.

Grisee (Geresik) (*Lat. 7° 9' S., Long. 112° 39' E.*) is a place of considerable trade, and frequented by coasting vessels. A pier projects, about 500 yards, to the edge of the mud-flat. In addition to the great post road, there is frequent communication with Surabaya by a regular service of small steam vessels.

Giri hills are a mile and a half south-west of the town; on Petukan-gan, the eastern summit, of 413 feet, is a remarkable dome-shaped wood, with a white pyramid a little westward, these, in clear weather, are seen from a long distance. The hill slopes to the coast eastward.

The shore from Grisee forms a deep curve southward and eastward to Surabaya, the bight between is filled with a bank of mud and sand, very steep-to.

Eastern side of the strait.—Between Tanjong Modung and Ujong Piring, 11 miles 241° true, the Madura coast forms a shallow bight fronted by shoals. From Ujong Piring, the coast trends south-south-west for 2½ miles to Tanjong Bulu, covered with high trees, and

General charts 1654, 941b, 2759a.

Plan of Surabaya strait on 93½. Var. 1° 30' E.

is fringed by a narrow bank. Between Tanjong Bulu and Tanjongan, 5 miles 169° true, there is a considerable indentation filled with a mud-flat, which projects for half a mile round Tanjongan. Thence the Madura coast trends 121° true for 2 miles and then east; this part is fronted by a shelving bank with 2 fathoms at the edge half a mile from the coast.

Dangers.—**Jamuang reef**, nearly 3 miles within the edge of Zee bank and 5½ miles 261° true of Tanjong Modung, is on the point of shoal water projecting from Madura island, and at low water dries over a length of 5 cables. On the south-west side of the reef is a small square white house, on iron piles, containing a self-registering tide gauge.

From Jamuang reef a training wall, 7 miles in length, bounds the east side of the ship channel, as far as Ujong Piring. The top of the wall, which is 10 feet in width, is even with the level of highest water.

Beacon.—On the north end of the wall is an iron basket beacon.

Van Drieen (Trinity) reef (*Lat. 7° 8' S., Long. 112° 39' E.*), of 15 feet water, is 175 yards in diameter, and nearly in mid-channel 1½ miles 12° true from the Grisee lighthouse. The reef is very steep-to on the east side.

Light-buoy.—A white light-buoy is moored on the eastern side of Van Drieen reef, and exhibits a *white occulting light every twenty seconds*, thus:—light *ten seconds*; eclipse, *ten seconds*.

Pisang reef, on the west side of the channel, 2½ miles south-east of Grisee, is 1½ cables long and about half a cable broad, and nearly dries at springs. The east side of the reef is steep-to, and the current runs strongly past.

A small reef, with a least depth of 14 feet over it, lies 8 cables, 125° true, from Pisang reef.

Light-buoy.—A white light-buoy is moored on the eastern side of Pisang reef and exhibits a *white occulting light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*.

The reef to the south-eastward is marked by a white conical buoy on its northern side.

The Buffels are two large rocks on the north side, 1¼ miles 151° true of Tanjongan. The northern rock is close to the low water edge and just covered at high water; the outer rock is within the 3-fathoms line and dries 7 feet.

Piers.—There are landing piers, extending to low water line, at Sembilangan and Tanjong Kamal, from the latter a steam tram runs north to Bangkalan.

About 50 yards south-west of the extremity of a pier, one mile north-

General charts 1654, 941b, 2759a.

Plan of Surabaya strait on 934. Var. 1° 30' E.

ward of Sembilangan lighthouse, is a self-registering tide gauge, contained in a small white house on iron piles.

Fishing stakes, of pinang stems, placed athwart the passage, and projecting 3 to 6 feet above high water, stand mostly on the western side of the channel through Zee bank, on the eastern edge of Solo bank, and a little northward of Grisee; also on the east side of the channel southward of Sembilangan. Some of these extend into 25 feet water, and may be a danger to sailing vessels working in.

LIGHTS.—Ujong Piring.—A *fixed red* light is exhibited, at 46 feet above high water, from a white iron framework, situated on Ujong Piring; it is visible from a distance of 13 miles over an arc of 5° on each side of the leading line.

Sembilangan (*Lat. 7° 4' S., Long. 112° 40' E.*).—A *white flashing* light *every three seconds*, showing a flash of *one second* duration, is exhibited, at an elevation of 174 feet above high water, from a white iron tower with the upper part painted black and 190 feet in height, situated near Sembilangan, and should be seen from a distance of 19 miles.

The above lights in line, bearing 200° true, lead through the deepest part of the buoyed channel into the strait.

Grisee.—A *white fixed* light is exhibited, at an elevation of 42 feet above high water, from a white iron frame, 46 feet in height, situated a little to the northward of the pier at Grisee.

Floating dock.—A *white fixed* light is exhibited from each of the outer angles of the floating dock, moored about 1½ miles westward of Surabaya moles.

Surabaya.—Two *red fixed* lights are exhibited at distances of 26 feet and 98 yards from the west mole head at the entrance to the naval basin at Surabaya.

From similar positions on the east mole are exhibited two *green fixed* lights.

As a daymark, the outer lamp-posts are fitted with a triangular screen, the inner posts with a rectangular white screen.

Surabaya (west) light-vessel is moored on the line of the leading lights, at a distance of 10⁴/₁₀ miles, 20° true, from Ujong Piring lighthouse; it is painted black with *Soerabaja* in white letters on the sides, and has one mast and a signal yard.

At night, a *white flashing* light *every fifteen seconds*, showing a flash of *four seconds* duration, and visible from a distance of 12 miles, is exhibited from a red iron lattice tower. An anchor light is exhibited both at bow and stern.

Pilots.—The light-vessel is a pilot station; should the pilot be unable to board a vessel from any cause, flag D of the International code will be shown by day, and a *red fixed* light by night.

General charts 1654, 941b, 2759a.

Plan of Surabaya strait on 934. Var. 1° 30' E.

Buoys.—The western side of the channel from sea to Ujong Piring is marked by white buoys. The five bar buoys show, the first a *white occulting* light, the second a *white fixed* light, the third a *green fixed* light, the fourth and fifth a *green fixed* and a *white occulting* light, respectively. Nos. 3, 4 (conical), and 5 buoys mark the eastern side of Middelrug spit; No. 3 has a ball, and No. 5 shows a *white occulting* light. No. 6, white conical with ball, marks the eastern side of Solo bank, off Fort Erfprins.

The eastern side of the channel is marked by black buoys. The outer bar buoy shows a *white occulting* light, the second a *red fixed* light, the third a *white fixed* light. No. 3, can with a truncated cone, is on the west side of Jamuang reef. No. 4 is a can.

A black can buoy, surmounted by a truncated cone, is moored about $1\frac{1}{10}$ miles south-south-westward of Tanjongan.

A light-buoy, with red and black horizontal stripes, moored $2\frac{8}{10}$ miles, 325° true, from the citadel, marks the southern edge of the shoal off Kamal; it exhibits a *white occulting* light every twenty seconds; light, ten seconds.

A green buoy, which marks the wreck of a sunken dock, is moored a quarter of a mile westward of the Surabaya pierheads; a white light-buoy, No. 7, showing a *white occulting* light, in 24 feet of water, south-east of the easterly pier at Kamal; and a white conical buoy surmounted by a staff and ball, No. 6, on the southern edge of the shoal south of Mount Kamal.

Caution.—The channel over the bar is subject to constant change, and the light-buoys are moved accordingly.

Telegraph cable.—To mark the cable which crosses the channel from Tanjongan point (*Lat. $7^\circ 9' S.$, Long. $112^\circ 42' E.$*) to Semambung, two black can buoys are on the edge of the bank on the Madura side, and two white conical buoys on the Java shore. Vessels are prohibited from anchoring near the line of cable.

Tides.—At the north entrance to Surabaya strait the tides are almost exclusively diurnal, with one high water and one low water each day, the high and low waters being approximately 12 hours apart. The highest, or spring, tides are governed by the declinations of the sun and moon, and not by the moon's phases.

In the middle of June the highest spring tide is about Xh. a.m., and in the middle of December at Xh. p.m.; the intermediate times between two springs, are earlier at the rate of two hours each month as follows:—For four days after springs the high water is half an hour later each day, it then rapidly accelerates until two days after neaps, when the high water is two hours earlier than at springs; a daily retardation now sets in, so that the next spring high water is about one hour earlier than the last.

The greatest range, in June and December, varies from 7 to 5 feet; in March and September from 3 feet to one foot.

Plan of Surabaya strait on 934. Var. 1° 30' E.

Neap tides are 7 days after springs; the larger range of these, in June and December, is 4 feet, and the smaller, in March and September, about one foot.

Near Sembilangan (*Lat. 7° 4' S., Long. 112° 40' E.*) the movements of the water are compounded of the diurnal tide wave of the Java sea, and the semi-diurnal from Madura strait, but the former preponderates. In March and September the double tides are most marked.

Spring range is 8 to 5 feet, and neaps may be as little as one foot.

Tidal streams, in West Gat, run twice north and twice south each day, and the times of turning are very irregular; there is no direct connection between the vertical and horizontal movements of the water. The average strength at springs is $2\frac{1}{2}$ miles, at neaps about one mile; the greatest observed was $3\frac{1}{2}$ miles.

DIRECTIONS for North channel.—During the east monsoon, especially in the morning, the prevailing mist will frequently hide the coast hills of Java and Madura, and often also the light of Sembilangan.

Coming from westward, a depth of not less than 8 fathoms must be maintained, until past the light-buoy off the entrance of Sungai Solo, the buoy being left on the starboard hand; when past the buoy, the flat-top hill of Malang, open north of the Doodkisten 255° true, will clear the north edge of Zee bank, until the light-vessel is reached. (View on chart 934.)

From eastward, the water should not be shoaled to less than 8 fathoms, or Tanjong Modung brought to bear east of 113° true.

The lighthouse of Sembilangan, 200° true, leads to the buoyed channel, and on nearing Zee bank the light-frame on Ujong Piring will be sighted; the two in line, 200° true, at present cross the bar in the deepest water, and lead between the white buoys on the west and the black buoys on the east side of the channel, but the bar is subject to constant change. When between No. 3 black and white buoys Sembilangan lighthouse is to be gradually opened westward of Ujong Piring lighthouse to clear the edge of the eastern bank, and Menari tree steered for until the tide-gauge house at Sembilangan is nearly on with the trees beyond the lighthouse; then more southerly into the deep channel of West Gat, on either side of Van Drieen reef, and north of the white light-buoy of Pisangs.

At night, the *flashing* light of Sembilangan is to be steered for, bearing 200° true, and when the low light on Ujong Piring is seen, the two in line lead into the channel. On passing No. 5 light-buoy within three-quarters of a mile, the line of lights must be abandoned, and Sembilangan light gradually opened westward of Ujong Piring light, until it bears 187° true, then, with due attention given to the

General charts 1654, 941b, 2759a.

Plan of Surabaya strait on 93½. Var. 1° 30' E.

tidal stream, steer for the centre of West Gat channel. On losing sight of Ujong Piring light, bearing 65° true, steer for Grisee light, 183° true, and this light must not bear more than 188° true until the buoy on Van Drieen reef is sighted. When past Grisee the light may be brought 308° true, and a course 128° true leads between the Buffels and Pisangs buoy light; then eastward for the anchorage in Surabaya road.

The roadstead of Surabaya is bounded on the east by the line 339° true from the green buoy westward of the piers, westward by a line 159° true from the Buffels, and northward by a line 96° true from the summit of Mount Petukangan.

The bottom is sand and mud, and being fairly hard, vessels sometimes drag, when a strong wind and tidal stream combine. Anchorage is prohibited within 550 yards of the basin entrance, between the *red* lights in line and the *green* lights in line; mooring is compulsory, and owing to the strong outset from the rivers, ships usually swing head southward. On the edge of the flat extending from the north side, there are depths of 3½ fathoms, 9 cables from shore.

SURABAYA (*Lat. 7° 13' S., Long. 112° 44' E.*), the chief town of the province, and in importance the second city of Java, is situated on the Kali Mas, navigable by native boats, and kept at a depth of 3 or 4 feet, by dredging. The Kali Semampir, a branch of the Mas, flows along the east side of the town, almost parallel to, and distant 1,100 yards from the Mas; this stream is also fit only for boats, and the passage from sea is marked by two white buoys, the least water being one foot.

Between the mouths of these rivers is the entrance to the marine basin and naval establishment.

The town consists of three portions, the government section, nearest the sea, between the Kalis Mas and Semampir; the European quarter, commencing about one and a half miles from shore; and beyond this, scattered over a large area, the Chinese and native town, the whole extending inland some 5 or 6 miles.

Water is brought, by pipes, from Kasri.

The country in the neighbourhood is low, flat, and intersected by numerous boat channels, while westward of the town, stretching nearly to Grisee, is a marshy tract, with tall brushwood near the coast, and many fish-ponds.

Population.—In 1905 the population of Surabaya was 150,198, including 8,063 Europeans, 124,473 natives, and 14,843 Chinese.

Time signals are shown from a white mast, 65 feet high, 40 feet within the western mole head of the marine basin. The apparatus

General charts 1654, 941b, 2759a.

Plan of Surabaya strait on 93½. Var. 1° 30' E.

consists of four round black discs, which, 5 minutes before noon, are raised to an angle of 45°; placed vertically 2 minutes before; and at 0h. 0m. 0s. Central Java mean time, corresponding to 16h. 40m. 45.5s. Greenwich time, the discs are dropped horizontal. Should the signal be made too early, or too late, a red flag with white centre will be hoisted on the flagstaff above the discs until 1h. 0m. 0s., when the signal will be repeated as above.

A blue flag signifies that the apparatus is out of order, and that there will be no further signal on that day.

On Sundays and holidays no signals are given.

Hospital.—There is a large military hospital, with accommodation for 400 patients, and on the extremity of the eastern mole of the marine basin is a hospital for contagious diseases.

The marine establishment, between the mouths of the Mas and Semampir, is replete with all modern mechanical and engineering appliances; large repairs can be executed to boilers, engines, and hull.

The entrance to the Government basin is about 90 yards wide, between two stone piers; the depths in the entrance and approaches are maintained by dredging, there being 34 feet at high water in the entrance.

There is generally only one slack tide for each daylight, lasting only about 20 minutes, and it is necessary for large ships to be taken in or out during that period.

The guard ship is moored off the marine establishment.

Sheers.—There are sheers capable of lifting 60 tons, the spread beyond quay wall being 29 feet, and the hoist 74 feet.

Docks.—*See Appendix.*

Shipping.—In 1912, 439 steam vessels of 1,172,610 tons, and one sailing vessel of 1,279 tons, entered the port of Surabaya (*Lat. 7° 13' S., Long. 112° 44' E.*); of these, 133 steam vessels of 264,216 tons were British.

Coal.—About 14,000 tons of coal are imported annually, and about 4,500 tons of coal and 1,000 tons of liquid fuel usually kept in stock. Coaling is carried out by lighters, and is somewhat slow, as they have to wait for high water before coming out of the river.

Communications.—Surabaya is in connection with all the main railway lines of Java; a branch runs along the east side of the Kali Mas and into the naval yard. There is telephonic communication with Semarang and Batavia, and by telegraph with other parts.

Steamers run between Surabaya and other parts of the archipelago. *See page 9.*

General charts 1654, 941b, 2759a.

Plan of Surabaya strait on 934. Var. 1° 30' E.

Winds.—In the eastern monsoon, the sea breeze at Surabaya is northerly, being strongest about noon, and decreases towards evening; the land wind, from south, comes off about sunset. The early mornings are calm and misty.

In the western monsoon, the wind blows most of the day, with considerable strength, from north-west or west-north-west, drawing into south-west and becoming light at nightfall.

Eastern entrance to Surabaya strait.—Like the north entrance from the Java sea, the eastern approach by Madura strait is entirely occupied by a large and shallow bank; through this there is a buoyed and lighted channel of 12 feet at low water springs.

The Java shore, eastward and southward of Surabaya, is low and overgrown by brushwood, with extensive fish-ponds within; and, except by a narrow sand strand between the villages of Panembangan and Kenjiran, and a white pillar on the south side of Wonokromo canal, there are no distinguishing points visible. A bank of sand and mud dries out a half to one mile.

The southern coast of Madura from Tanjong Kamal takes an easterly direction 17 miles, to Tanjong Gumung, with many native villages near the shore; the western portion rises in gentle slopes to the low coast hills; the eastern part is steeper and ascends more abruptly from the sea. Two miles eastward of Tanjong Kamal is a conspicuous red cliff.

A bank of sand, mud and stones, dries out nearly three-quarters of a mile from the eastern part of this shore, lessening in width as the mouth of the strait is approached. South of Gading, $1\frac{1}{2}$ miles, is the site of an unfinished fort, covered by one foot of water.

Kleta reef (*Lat. 7° 20' S., Long. 112° 52' E.*), a stony patch, of 6 inches water, is on the west side of the ship channel, near the south entrance, and $3\frac{1}{2}$ miles from shore. A small house, containing an automatic tide gauge, is erected on the north side of the reef.

Fishing stakes, similar to those described on page 134, are placed across the direction of the channels, on the Tongue between the two passages, and extend from both the Java and Madura shores; these may project into 18 feet water, and being sometimes covered at high tide are a source of danger to be avoided.

Landmarks.—Approaching the strait from eastward, the four hills on Madura, Mounts Telok, Seleret, Sereng, and Kemiri, will be readily recognised; the latter, 645 feet high, with four summits, is remarkable.

Eastern ship channel.—Buoys.—Through the bank at the eastern entrance of the strait, there are two channels leading into

General charts 1654, 941b, 2759a.

Plan of Surabaya strait on 934. Var. 1° 30' E.

Surabaya road, with a common entrance at the south-east end; the western or old Jansen channel is unmarked, and the depth is decreasing, the eastern passage, about 12 miles in length north-west and south-east, is buoyed and lighted. At the north-west end the two channels are divided by a ridge of hard sand and mud called the Tongue; the inner end dries at low water, and there is from a half to three-quarters of a fathom water over other parts.

The eastern side of the channel is marked by five conical white buoys, numbered consecutively from seaward; of these, Nos. 1, 2, and 4 are gas-buoys, Nos. 1 and 4 showing a *white fixed* light, and No. 2 a *white occulting* light.

The western side of the channel is marked by four black can buoys, numbered similarly to the white buoys. Nos. 1 and 3 have a staff and truncated cone topmark.

In addition, there is a black conical light-buoy, No. 5, showing a *white occulting* light every twenty seconds, $4\frac{9}{10}$ miles, 64° true, from the citadel; a red and white chequered buoy, with staff and ball, at the north-west extreme of the channel, about a mile to the westward of the preceding buoy; and a black and white chequered buoy, surmounted by a ball, the eastern mark for the measured distance.

Depths in the channel.—The least depth at low water is 13 feet; in June and December, when the range of tide is greatest, the depth at high water may reach 22 feet.

Surabaya (east) light-vessel (*Lat. $7^\circ 23' S.$, Long. $112^\circ 57' E.$*), at the eastern entrance to Surabaya strait, is moored in 22 feet water, south-eastward of No. 1 buoy. The vessel, coloured black with *Soerabaja* in white letters on both sides, has two masts, with signal yard on foremast, and ensign staff at the stern. A *fixed white* light, visible from a distance of 12 miles, is exhibited. The vessel is a pilot station.

Pilots.—With the exception of Government vessels, whether Netherlands or foreign, all ships with a draught exceeding $5\frac{1}{2}$ feet must pay pilotage; they need not, however, take a pilot. No pilot is compelled to take charge of vessels drawing upwards of $19\frac{1}{2}$ feet.

Should the pilot be unable to board a vessel from any cause, flag D of the International code will be hoisted on the light-vessel by day, or a *red* light by night.

Measured distance.—For testing the speed of ships, a distance of 7,513 feet is measured on the Madura shore, north-eastward of the town; the marks are two sets of iron posts, with screens of white lattice-work standing rectangularly on each. The running line is between the white No. 6, of the eastern series of channel buoys, to the westward, and a black and white chequered buoy to the eastward.

General charts 1654, 941b, 2759a.

Plan of Surabaya strait on 93½. Var. 1° 30' E.

Tides.—In the eastern entrance to Surabaya strait there are two tides of unequal range in 24 hours; at springs the inequality of height is most marked, while at neaps the lesser tide is sometimes scarcely noticeable.

It is high water, full and change, about XIh. 30m.; the greatest rise, 9 feet, is in June and December, the least in March and September. Neaps range 3 feet in June and December.

In June spring high water of the greater tide occurs about XIh. 30m. a.m., and of the lesser about XIh. 30m. p.m. The difference in range gradually lessens until the two tides are nearly equal in September; after this time the lesser tide becomes the greater, and in December the highest spring high water is about XIh. 30m. p.m., and the lower about XIh. 30m. a.m.

Similarly a retrograde action will cause the two tides to be nearly equal in March, and in June the day tide will again be the larger and the night tide the smaller.

In the roadstead of Surabaya the spring range is generally a foot less, and the movements of the water are often very irregular.

Tidal streams.—With a rising tide the stream runs into the strait, with a falling tide outwards; and though the times of change are irregular, they are about high and low water, but influenced by the prevailing monsoon. Near the light-vessel the rate of the stream amounts to about 2 knots, in the vicinity of Surabaya roadstead about 3 knots, and may considerably exceed this in the narrow parts of the channel; outside the fairway on the banks and under the shore the stream seldom runs more than one knot. The rate is greater with the chief tide than at the smaller, and is stronger at springs than at neaps.

Chart 1654, Island of Java, eastern portion.

Dangers.—The following description of islands and rocks, although in the deep water of Madura strait, is given here as more convenient when approaching Surabaya from the eastward.

Kambing island (*Lat. 7° 18' S., Long. 113° 13' E.*), 4 miles from the south coast of Madura, is about 1½ miles in length, east and west, low, but wooded, the tops being about 100 feet above the sea. A coral reef, which dries at low water, surrounds the islands; the reef is steep, with 11 to 17 fathoms close-to. The channel between Kambing and Madura is narrowed to a navigable width of 2 miles by the spit which runs out from Tanjong Batu Putih, page 163.

Manila rock, 3½ miles 211° true from the west end of Kambing island is about one cable in diameter and awash at low water, steep-to, with 22 to 26 fathoms around.

General charts 1654, 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 1° 40' E.

Sirumpa rock, $4\frac{1}{2}$ miles 323° true from Koko lighthouse, is about one cable in diameter and covered by 5 feet at low water, steep-to, with depths of 14 to 22 fathoms around, muddy bottom.

Bura reef, $5\frac{1}{2}$ miles 288° true from Koko lighthouse, is a patch of sand and coral, nearly circular, about 500 yards in diameter, and awash at low water.

Buoy.—It is marked by a red buoy, with staff and ball, moored on the south-west side. The soundings around the reef show 13 to 22 fathoms.

Zwaantjes reef (Karang Koko) is elliptical in shape, about half a mile long east and west, and consists of growing coral, rock, and sand; a sandbank on its western part always shows. The reef is steep-to, with depths of 20 fathoms at a distance of 3 cables.

LIGHT (*Lat. $7^\circ 28'$ S., Long. $113^\circ 7'$ E.*).—On the middle of the dry sandbank on Zwaantjes reef, a *flashing white* light, showing a *flash of four seconds every half minute*, is exhibited from a white iron lighthouse 52 feet in height. It is elevated 54 feet above the sea, and visible at a distance of 12 miles. The light-vessel at the entrance of Surabaya strait can be sighted from the light in clear weather.

Eendrachts rock, or **Karang Chongkeh**, is a small rocky patch about 4 miles 108° true from Koko lighthouse. It is covered by 3 feet least water, and is steep-to.

Buoy.—A red buoy with staff and ball is moored on its north-west side.

DIRECTIONS.—In the east monsoon it is generally misty in the morning, from sunrise until the setting in of the sea breeze. Approaching from eastward, the roadstead of Probolinggo will probably be recognised before the lighthouse of Zwaantjes reef is seen, a course then for the light-vessel may be steered.

General charts 941b, 2759a.

CHAPTER VI.

MADURA, BALI, AND SAPUDI STRAITS.—MADURA, KANGEANG,
AND BAWEAN ISLANDS.

VARIATION in 1914.—Stationary.

Chart 1654, Island of Java, eastern portion. Var. 1° 40' E.

MADURA STRAIT is the wide channel between the island of Madura and the eastern portion of Java, being about 90 miles long, east and west, and 30 miles wide.

Winds.—The monsoons in Madura strait are comparatively feeble, but the easterly is the stronger; and the high lands on both sides cause land and sea breezes which materially interfere with the steadiness of the periodic winds.

The easterly monsoon begins in April and blows from east-south-east, reaches its full development in May, and remains stationary until September; in October it begins to abate in strength and constancy. On the south side of the strait the wind will be steadiest at night, and in conjunction with the land breeze will draw into south-south-east; in daytime the opposition of the sea breeze will cause the wind to be less reliable in strength and direction. Contrary conditions on the north side of the strait will produce steady winds by day, but feeble and variable at night.

The westerly monsoon, owing to the large masses of land to windward, is greatly impeded, January and February being the only months during which it blows with reliable steadiness, and then from west to west-north-west. At this season the wind is more constant near the Java coast in daytime, and on the Madura side at night.

Weather.—A cloudless but very hazy sky is the prevailing feature of the easterly monsoon, and rain seldom falls. From June to September considerable swell may roll in from eastward, and when in opposition to the tidal current, will cause a short chopping sea.

The rainy months are December to March, in the westerly monsoon; about one day in three will be wet. Squalls and thunderstorms are infrequent.

Tides (*Lat. 7° 41' S., Long. 114° 26' E.*).—At Karang Mas the tides are of mixed character, the single day tide predominating. The

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Chart 1654, Island of Java, eastern portion. Var. 1° 40' E.

double tide has springs about half a day after new and full moon, at XIh., with range of $2\frac{1}{2}$ feet; neaps at Vh., with one foot. The single tide has high water on 1st January at VIIh. p.m., and on 1st July at VIIh. a.m., with the usual retrogression of two hours each month; springs range 4 feet, one day after the moon's maximum declination; neaps range one foot, one day after minimum declination. The greatest range is about XIh. a.m. in May, and XIh. p.m. in November.

At Zwaantjes reef the spring tide is about half an hour later, with nearly equal range for single and double tides, and there are always two high and two low waters in 24 hours, except when the moon's maximum declination is at neaps, when only one tide occurs.

NORTH-EAST COAST OF JAVA.—From Tanjong Kalabangkang, east of Surabaya, the coast runs south for 25 miles and then turns east, forming the south side of Madura strait.

The western portion, south of Kalabangkang, offers no noticeable points, and presents an evenly wooded appearance, and many fishing villages. There is a white pillar on the south point of Wonokromo canal. Extensive banks of mud and sand, which dry at low water, render approach to the shore difficult; off Tanjong Tambak Agung, the flat uncovers nearly 3 miles out.

From Pasuruan 70 miles eastward to Tanjong Pachinahan, the intermediate shore is low, wooded, and, except at the salient points, fringed by mud and sand drying out in some places for a mile. There are many villages, but the only towns of importance are Pasuruan, Proboingo, and Besuki.

Mountains.—The eastern promontory of Java is only from 30 to 60 miles across, but it contains the highest mountains in the island. Mount Semeru (*Lat. 8° 6' S., Long. 112° 55' E.*), the highest in all Java, rises near the southern coast to a height of 12,061 feet, and can be seen from Madura strait over the slopes of the nearer mountains; the summit consists of two peaks, from the eastern of which smoke rises in heavy columns. North-westward of Mount Semeru is a detached range, seen from Surabaya, rising in Mount Arjuno to nearly 11,000 feet.

Tenger mountains constitute one of the most remarkable volcanoes of the island, rising from a very large base in a gentle slope, with gradually extending ridges. The summit, seen at a distance, is less conical than most of the other principal volcanoes, varying in height at different points 8,000 to nearly 9,000 feet. The central crater, 8,645 feet high, is considerably below the highest point, and consists of a large excavation of irregular form, surrounded on all sides by hills of different elevations. It is one of the largest active craters on the globe.

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Chart 1654, Island of Java, eastern portion. Var. 1° 40' E.

To the eastward of Tenger there rise several other high mountains, the most remarkable being the volcano Lemongan which rises in two peaks to the height of 5,479 feet. Further east the great peaks of the Hiyang mountains are conspicuous, rising to 10,132 feet. A spur of this mountain reaches down to the coast near Besuki. The Ringit range, near the coast east of Besuki, presents many fantastic peaks, the westernmost and highest is 4,100 feet above the sea.

Near the eastern extremity of the island rises another lofty range, on the western side is the volcano Raung, 10,932 feet high; its summit presents a great plateau on which lies the crater. The most easterly mountain of this range is the conical shaped Mount Merapi, 9,187 feet high, whose slopes reach to Bali strait.

Caution.—On the southern shore of Madura strait are many sugar factories, the electric lights of which are visible from seaward.

Plan of Pasuruan road on 3672.

Pasuruan, the chief place of the Residency of that name, with nearly 29,000 inhabitants, lies on the bank of the Kali Gembong, in a fertile country containing several distilleries and refineries; the railway from Surabaya to Probolinggo passes through it.

Supplies.—Provisions, and water of good quality, are procurable at cheap rates.

Anchorage.—The road is exposed to northerly and easterly winds, but it is quite safe with west winds. The anchorage is in 5 to 7 fathoms, mud, with the flagstaff bearing 203° true, distant about 2½ miles.

Tides.—It is high water, full and change, at Pasuruan, at Xlh. 16m. Springs rise 8 feet.

LIGHT (Lat. 7° 37' S., Long. 112° 55' E.).—From a white iron framework, 43 feet in height, situated on the west side of the river entrance, is exhibited, at an elevation of 43 feet above high water, a group occulting white light, showing two eclipses every thirty seconds, thus:—light, three seconds; eclipse, three seconds; light, twelve seconds; eclipse, twelve seconds. It is visible from a distance of 10 miles.

Tanjong Warangan, 7 miles east of Pasuruan, is a rounded point formed by the spurs of Semongkrong hill, 276 feet high, which rises near the coast. There are remarkable trees on the point and on the hill which serve as landmarks. Soundings show 9 fathoms depth at 2 miles outside the point; within this distance the water shoals rapidly.

Plan of Probolinggo road on 3311.

Ketapang island is a low wooded island about a mile in length east and west, surrounded by a coral reef which extends on the north-

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Plan of Probolinggo road on 3311. Var. 1° 40' E.

east side, to a distance of one cable, and dries at low water. Around this reef, a quarter of a mile off, the depth is 10 fathoms.

Katon reef, 2 miles 248° true from the west point of Ketapang island, and about the same distance 350° true of the harbour light of Probolinggo, is a patch of sand and coral 160 yards in diameter covered by 4½ fathoms least water, with 8 and 9 fathoms around. The depth between the reef and Ketapang island is 7 fathoms.

Buoy.—Katon reef is marked by a black conical buoy with staff and ball.

Probolingo.—This is an open port and the present railway terminus from Surabaya; it is at the mouth of a river at the extremity of a point south-westward of Ketapang island. Two stone piers extend from the mouth of the river to the edge of the shore bank, forming a harbour for coasters. Provisions can be obtained here, but water is brought in praus from Pasuruan. The population in 1905 numbered about 15,000.

LIGHT (Lat. 7° 43' S., Long. 113° 13' E.).—From a white iron framework 46 feet high, on the west pierhead at Probolinggo, is exhibited, at 49 feet above high water, a *white group occulting* light, showing three eclipses *every forty seconds*, thus: — light, *twenty seconds*; eclipse, *four seconds*; light, *four seconds*; eclipse, *four seconds*; light, *four seconds*; eclipse, *four seconds*, and visible 11 miles.

The anchorage is about a mile from the shore, in 7 fathoms, with the entrance of the harbour open, and the lighthouse bearing 181° true.

Chart 1654, Island of Java, eastern portion.

Kraksahan.—Between Probolinggo and Tanjong Gerinting, 17 miles 81° true, the coast forms a bay the shore of which continues lined by a shoal bank. The depth of water increases rapidly along this part, and at a distance of 1½ miles from the shore the soundings show 10 fathoms. Several sugar factories stand near the shore, the produce of which is mostly shipped at Kraksahan, a small village on Kali Buntu.

The anchorage off Kraksahan is in 10 fathoms, with the eastern edge of a wood standing in the water bearing 181° true.

Wreck buoy.—Near the anchorage at Kraksahan a conical buoy coloured in red and white bands, with ball, marks a wreck over which there are 4½ fathoms water. From the buoy the chimney of Pajarakan sugar factories bear 196° true.

Tanjong Gerinting (Bedulan) is a low sandy point undistinguishable from the offing; the point is steep-to, soundings showing 10 fathoms at half a mile distant, and 2 fathoms at about 4 cables.

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Chart 1654, Island of Java, eastern portion. Var. 1° 50' E.

Coast.—From Tanjong Gerinting the coast trends east for 27 miles, and then north-east for 8 miles to Tanjong Pachinahan. In this stretch there are two projecting points, neither of them very prominent. They are Tanjong Ketah near Besuki, low and sandy, and Tanjong Pecharon, a spur of Ringit mountains. The shore is fringed by a narrow sandbank, from which the bottom slopes to 10 fathoms at half a mile distance. With the exception of Mounts Loros and Temporah there are no noticeable coast marks. Mount Loros is a remarkable cone, 1,772 feet high, rising about midway between Tanjong Gerinting and Besuki, and $1\frac{1}{2}$ miles inland. Mount Temporah is a rounded hill 325 feet high, standing on the shore 2 miles west of Besuki.

About 2 miles eastward of Tanjong Gerinting, near the mouth of the Kali Paiton, there is a landing-stage for praus. Steam vessels load sugar at the anchorage off Paiton.

Keranji rock (*Lat. 7° 42' S., Long. 113° 34' E.*).—This little coral reef, about 2 cables in diameter and covered by 9 feet at low water with 12 fathoms around, lies about three-quarters of a mile off-shore, with Tanjong Gerinting bearing 271° true, about 5 miles distant. To clear this reef vessels working near the shore should keep the conspicuous trees of Besuki well open of Temporah hill.

Plan of Besuki road on 3311.

Besuki, the capital of the Residency, which comprises the eastern part of Java, is an open port for exports only, with a population of about 5,000. It may be recognised from seaward by the white warehouses, and by a fine group of Banian trees which can be sighted at some distance. The Kali Besuki flows past the town into the strait.

LIGHT.—A *fixed white* harbour light is exhibited from a white iron frame lighthouse, 46 feet high, near the entrance of the Kali Besuki. It is raised 47 feet above the sea, and is visible at a distance of 8 miles.

Anchorage.—The anchorage is about half a mile from the shore in 10 fathoms, mud, with the lighthouse bearing 160° true, and the north extreme of Mount Temporah in line with Mount Loros, 256° true. This position is 3 cables from the edge of the steep sandbank which borders the shore and dries at low water.

Supplies.—Provisions are procurable, but water can only be obtained with difficulty from wells near the town.

Tanjong Ketah is low and sandy, and difficult to make out from seaward. It is bordered by a sandbank 4 cables wide, which dries at

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Plan of Besuki road on 3311. Var. 1° 50' E.

low water, and is steep-to. Mount Temporah, bearing 241° true, and well open southward of Mount Loros, will lead 4 cables north of the edge of the bank.

Plan of Panarukan road on 3672.

Tanjong Pecharon is bordered by a reef 2 cables wide, which dries at low water, and is steep-to, with 20 fathoms water near the edge.

Two miles 99° true from Tanjong Pecharon, and three-quarters of a mile from shore, is a bank with 6 feet water.

Panarukan, an open port for exports only, lies at the head of the bay east of Tanjong Pecharon. It is a place of importance, carrying on a considerable trade with Madura. The port is unhealthy for Europeans, and the seat of Government is at Situbondo, 4 miles inland.

LIGHT (Lat. 7° 42' S., Long. 113° 56' E.).—A white flashing light every three seconds, showing a flash of one second duration, is exhibited, at an elevation of 48 feet above high water, from a white iron framework 46 feet in height situated near the landing place. It is visible from a distance of 11 miles.

Jamungan reef, two patches of rock and sand, covered by 2½ fathoms at low water, with 5 to 12 fathoms around. From them, Panarukan light bears 119° true, and 106° true, distant 7 and 9 cables; a red conical buoy marks the eastern reef, and a red conical buoy the western. A shoal of 3½ fathoms lies about 1¼ miles, 311° true, and a depth of 8 fathoms, 11 cables, 318° true, from the lighthouse.

The anchorage is in 10 fathoms water, at half a mile distance from the shore, and 4 cables north-east of Jamungan reef, with the harbour light bearing 153° true. It is exposed during the north-west monsoon, when a short high sea is frequent, causing great delay in shipping cargo.

Communication.—There is fortnightly steam communication with Surabaya, and railway connection with the main line southward.

Supplies.—Beef and water can be obtained here, but other provisions are scarce.

Paras reef.—From Panarukan, the coast trends north-east to Tanjong Pachinahan, and is partly bordered by a rocky reef which commences 2 miles from the town, projecting to one mile from the shore off the village Paras. The reef dries at low water, and is steep-to. Vessels approaching Panarukan from eastward will clear the reef by keeping the harbour light southward of 195° true. Between Paras reef and Tanjong Pachinahan the shore is bordered by a sand-bank, extending one mile out, with 2 fathoms over it.

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Plan of Panarukan road on 3672. Var. 1° 50' E.

Kalbut, a village 2 miles south-west of Tanjong Pachinahan, is a loading place for sugar from the factories about 3 miles inland. There is no special mark to distinguish the place from seaward, as the warehouse is not easily seen behind the trees, but there are generally trading praus at anchor off it.

Anchorage.—The anchorage is about $1\frac{1}{2}$ miles from the shore in 12 fathoms, with Tanjong Pachinahan bearing 80° true, and Tanjong Paras 215° true. It must be borne in mind that the bank is very steep-to, the water shoaling rapidly from 10 to 2 fathoms.

Supplies are difficult to obtain, and expensive.

Chart 1654, Island of Java, eastern portion.

Tanjong Pachinahan or China point (*Lat. $7^\circ 36'$ S., Long. $114^\circ 2'$ E.*), the northernmost point of Java in Madura strait, consists entirely of low sandy land. The point is very steep-to, there being 16 fathoms depth at a cable's distance to the northward; but westward of the point, a bank, covered by 2 fathoms water, extends for a distance of 2 miles; therefore, when making Panarukan from eastward, care must be taken not to round the point too closely.

Kombang bay, the bay between Tanjongs Pachinahan and Jangkar, 13 miles 114° true, is obstructed by several reefs, and should therefore be entered with great caution; the reefs, however, are out of the track to Surabaya strait, and would only be dangerous to vessels working up inshore.

Anchorage.—There is good holding ground for anchorage everywhere in the bay, and the chimneys of the sugar factories at Tanjong Sari and Jangkar are good marks for ascertaining a ship's position.

Telegraph cable.—A submarine cable is laid from Landangan, $5\frac{1}{2}$ miles south-east of Tanjong Pachinahan, to Buleleng in Bali. A shoal of 3 fathoms lies one mile 29° true from the telegraph house; and within the 3-fathoms line of soundings there are rocks which dry at low water.

Reefs.—Putih reef, in the middle of the bay between Tanjongs Pachinahan and Jangkar, is $1\frac{1}{2}$ miles from shore, with the telegraph house at Landangan bearing 271° true. It is of coral, 2 cables in length, and covered by one fathom water, with 12 fathoms around. A small shoal of 4 fathoms, with 7 fathoms around, lies $1\frac{1}{2}$ miles 260° true from Putih reef, and a depth of 5 fathoms $1\frac{1}{4}$ miles 243° true from Putih reef.

Agel reef, covered by 5 fathoms, with 11 fathoms around, is $3\frac{1}{2}$ miles 271° true from Tanjong Jangkar; and a small coral patch, of

General charts 1654, 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 1° 50' E.

2½ fathoms, with 10 fathoms around, lies 2 miles 271° true from Tanjong Jangkar.

Chart 3726, Bali strait.

Jangkar is the place of shipment for sugar from the factories of the neighbourhood. It is 2 miles south-west of Tanjong Jangkar, and may be recognised from seaward by a tall chimney, 140 feet high, some 2 miles inland, and by the zinc-roofed warehouses on the shore. The tall chimney, 161° true, will clear the 2½-fathoms patch, which constitutes the principal danger on making the road.

Anchorage.—There is good anchorage rather over half a mile from the shore in 8 fathoms, sand, with the warehouse bearing 181° true, and Tanjong Jangkar about 68° true.

Tanjong Jangkar (*Lat. 7° 42' S., Long. 114° 14' E.*) is a rounded point covered with high trees, steep-to, with soundings of 16 fathoms at a cable distance. The coast trends generally east-south-east for a distance of 15 miles from the point as far as Tanjong Sedano; it is steep-to, and fringed with a narrow strip of coral. This stretch of coast presents a very different appearance to that west of Tanjong Jangkar; rice fields and sugar plantations give place to dense forests, and the bare slopes of Mount Baluran rise immediately to the eastward of Tanjong Chotek, 5 miles from Tanjong Jangkar.

Chotek is the easternmost village on this coast; it stands about a mile eastward of Kali Banju Putih.

Anchorage.—There is anchorage off the village in 12 fathoms, sand, about a mile from the shore. During the easterly monsoon there is a great deal of sea and swell here.

Chotek reefs consist of four reefs half a mile distant from the coast and running parallel to it from a mile east of Tanjong Chotek to Tanjong Lumut; parts of them are always above water, and the white coral sand over them renders the whole line of reefs visible at a distance. There are gaps between the reefs, and between the reefs and the coast there is a narrow channel, with 5 to 12 fathoms, entered from the westward, in which praus and small vessels find shelter. The seaward edge of the reefs is steep, with depths of 20 fathoms close to.

Tanjong Lumut is wooded and steep-to, soundings of 36 fathoms being obtained at a cable's distance. The little strip of low land that separates the coast from the mountains here grows narrower towards the eastward, and terminates altogether at Tanjong Sumberbatok, 5 miles to the south-east, giving place to the rocky precipitous slopes of Mount Baluran. A narrow reef extends along

General charts 1654, 941b, 2759a.

Chart 3726, Bali strait. Var. 1° 50' E.

the shore between Tanjong Merak and Sumberbatok and dries at low water; the various creeks in this reef afford shelter to praus while waiting to proceed round the coast.

Tanjong Sedano (*Lat. 7° 50' S., Long. 114° 28' E.*), the north-easternmost point of Java, is distinguishable by three precipitous walls of rock at the extremity of a spur of Mount Baluran. The coast, which from Tanjong Lumut curves gradually round from east-south-east to south-east, here turns south and continues in that direction towards Bali strait. To the southward of the point a narrow strip of low land appears between the coast and the mountains. The depth of water at $3\frac{1}{2}$ cables from the shore is 90 fathoms, increasing immediately to over 100 fathoms.

The description of the east coast of Java will be continued with Bali strait, page 153.

Karang Mas, or Meinderts reef, consists of a group of five coral reefs lying 5 miles 36° true from Tanjong Lumut. The south-eastern reef is 2 miles long north-east and south-west, and from 2 to 4 cables wide. The eastern part of this reef is always above water; over the remainder of the reef the depth is from 5 to 9 fathoms. A small patch, covered by 6 fathoms, lies a quarter of a mile westward of the south-west end of the great reef.

The north-western reef is about a mile long, north-east and south-west, and covered by $2\frac{1}{2}$ to 8 fathoms. Two small patches, covered by $4\frac{1}{2}$ and 6 fathoms respectively, lie eastward of the northern end of this reef. The last patch is half a mile north of the lighthouse. A small patch covered by 7 to 9 fathoms is one cable west of the north-west reef. All these reefs are visible in clear weather owing to the discolouration of the water over them. In the basin formed between the reefs the depth is 20 to 26 fathoms, and outside around the depths are from 56 to 75 fathoms.

In 1912 discoloured water, apparently indicating the existence of a shoal, was reported $5\frac{1}{2}$ miles, 277° true, from Karang Mas lighthouse.

Anchorage in 24 fathoms, 3 cables west of the light, may be reached by steering on the lighthouse, bearing 72° true. With good light the southern part of the reef may be crossed by avoiding the discoloured water.

LIGHT—From a white octagonal iron tower on screw piles, 52 feet in height, situated on the eastern part of Karang Mas, is exhibited, at an elevation of 54 feet above high water, a *white occulting light every ten seconds*, thus:—light, *five seconds*; eclipse, *five seconds*. It is visible from a distance of 12 miles.

General charts 1654, 941b, 2759a.

Chart 3726, Bali strait. Var. 1° 50' E.

BALI STRAIT, which separates Bali island from Java, is about 50 miles in length, and though only one mile wide at its northern end, opens out to 28 miles at the southern entrance. This strait offers a safe passage to vessels bound southward during the north-west monsoon, and with the exception of Alas strait, east of Lombok, is to be preferred to all the passages east of Java, as there is anchorage on both sides of the narrows in case they should not be passed through in a single tide. The chief difficulty to contend with is the great strength of the currents, vessels having sometimes taken several days to reach Banjuwangi from the northward. Sailing vessels should only navigate this strait by day.

Winds.—To the eastward of Tanjong Sedano, or when the strait is open, the prevailing winds from April to October are from south-south-west and south-west, and after July are of considerable strength. In advancing from Tanjong Sedano a change of wind often happens suddenly as the strait comes open; but when past the entrance and towards the Bali shore, it will diminish in force and veer gradually to south-east. Very near Bali calms are often found. The limit between these south-east and south-west winds seems to be abreast of Mount Grogak, a hill on the north side of Bali about 20 miles eastward of the entrance of the strait, and therefore variable baffling winds and calms will be always found near that place.

The southern part of the strait being much wider, the wind is not so strong there, and near the Bali shore the regular land breeze usually occurs.

During the south-east monsoon the weather is always hazy and the high mountain tops of Bali and Java can rarely be seen.

During the north-west monsoon, from October or November to March, northward of the strait, faint southerly breezes prevail in the forenoon, and at noon unsteady winds from north and north-north-west with calms. The sea at this time is without any considerable swell. Southward of the strait, westerly winds and east and south-easterly currents are found as far as the limits of the trade winds. Near the south-east coast of Java heavy squalls from north and north-west and also from the south-west are often experienced. The smoothness of the water in this monsoon renders the task of working through the strait easy and speedy. It is well to have boats ready for towing the vessel when near the shore in calms.

Tides, at Banjuwangi (*Lat. 8° 13' S., Long. 114° 23' E.*), are usually double and single daily, the first largely predominant. The double tide has springs about two days after full and new moon, at XIh., the range being 5 feet; neaps occur at Vh., with one foot range.

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Chart 3726, Bali strait. Var. 1° 50' E.

The single tide gives high water, on the 1st January, at VIIh. p.m., and is two hours earlier each month following. The greatest range is 3 feet, about $1\frac{1}{2}$ days after the moon reaches greatest declination; neaps range one foot, when the moon passes the equator. The highest tides occur in May and November.

Tidal streams are influenced by prevailing winds; flood runs north, ebb south; the greatest velocity near Banjuwangi, is 2 to 4 knots, and in the narrow part of the strait, 6 to 7 knots. In the western monsoon the north-going stream runs longest, and with greatest strength, and the reverse in the opposite season; the change of direction is first on the Java shore, and it may be two hours later on the Bali side. Near Tanjong Pasir, at springs, the streams turn between 0h. and 1h.; at Banjuwangi about two hours earlier, and at Duiven island one to two hours later.

In the narrows during the south-east monsoon, when the wind draws strongly through in the direction of the strait, the south-running stream forms races and eddies in the middle, and towards Bali, so that a vessel will be whirled about and be with difficulty controlled; it is then advisable to keep on the Java side, where the water is deep close-to, rather than approach the reef-bound shore of Bali, where there is no anchorage.

EAST COAST OF JAVA.—From Tanjong Sedano the coast trends south for 4 miles as far as Tanjong Chandiban, whence it turns to the south-west for 3 miles and then southward again, forming a bight known as Bajulmati bay. Between Tanjongs Sedano and Chandiban the spurs of the Baluran mountains approach the coast, leaving only a narrow strip of low land between them and the shore. A narrow reef of coral fringes this stretch of coast, in which there are several creeks; the largest are on either side of Tanjong Lanon, about midway between Tanjongs Sedano and Chandiban. View at page 154.

Lanon reef, about $1\frac{1}{4}$ miles north of Tanjong Chandiban, and 2 cables from the shore, is a narrow reef half a mile long, covered by 3 feet of water with 45 fathoms close to the outer edge. When there is a swell, the sea breaks heavily; between the reef and the shore there is a narrow channel used by praus, with 13 fathoms water in it.

Tanjong Chandiban (*Lat. 7° 53' S., Long. 114° 28' E.*) is formed by a spur of the Baluran mountains. On the extreme point there is a hillock 65 feet high, with a few cocoanut palms, some graves, and a triangular pillar, all of which are conspicuous when standing out clear of the high land, but when seen against the mountains the point can only be discerned by the light colour of the hillock. A narrow reef

General charts 1654, 941b, 2759a.

Chart 3726, Bali strait. Var. 1° 50' E.

borders the point with detached rocks to the southward. The 10-fathoms line of soundings runs here about 3 cables off-shore, and anchorage in 14 fathoms, rocky bottom, may be had 4 cables off with Tanjong Chandiban bearing 271° true. Outside this position the water deepens rapidly to 40 fathoms.

Reefs.—A reef of white coral, a third of a mile long, lies three-quarters of a mile, 197° true, from Tanjong Chandiban; part of the reef is always above water, the remainder dries at low water with 23 fathoms close to the outer edge.

A similar reef, with two patches above water, lies three-quarters of a mile 248° true from the above reef. Near the outer edge the depth is 19 fathoms, and between the reef and the shore 8 to 10 fathoms.

A reef of coral and sand, about half a cable in extent, with 5 feet over at low water and 10 fathoms around, is near the shore off the mouth of Kali Bajulmati.

Crocodile rock (*Lat. 7° 57' S., Long. 114° 28' E.*). — This dangerous rock, one cable long, on which the depth is 12 feet at low water with 27 to 36 fathoms around, lies 186° true $3\frac{1}{4}$ miles from Tanjong Chandiban.

Shore reefs.—A group of coral rocks extending over an area of half a mile north and south, and a third of a mile east and west, covered by 2 to 4 fathoms water, lies 232° true one mile from Crocodile rock, and one mile from the Java shore; south of this reef at a quarter of a mile distance there is a small coral rock covered by 3 fathoms water.

A narrow reef, 2 miles long, the northern end of which lies west of the last reef, runs parallel to the coast at a distance of a quarter of a mile. The least water over it is one fathom.

A small detached coral rock covered by 3 fathoms half a mile south of the last. With the exception of Crocodile rock none of these reefs are dangerous to navigation, as they all lie within a mile of the shore and can be distinguished by the discoloured water over them. Between Crocodile rock and Duiven island the soundings increase from 33 to 70 fathoms. Near the edge of the shore reefs just described the soundings range from 20 to 28 fathoms.

Anchorage.—In Bajulmati bay, north-west of Crocodile rock, very good anchorage can be obtained in 22 fathoms, sandy bottom, with small stones, with the mouth of Kali Bajulmati bearing 271°, and Tanjong Chandiban hillock 23° true.

Duiven or Tabuan island, $1\frac{1}{2}$ miles from the Java shore and 3 miles north of the narrows of Bali strait, is a coral island covered with brushwood, and surrounded by a reef about 2 cables wide which

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Tanjong Banderj.

Mt. Merapi. Mt. Kukuan.

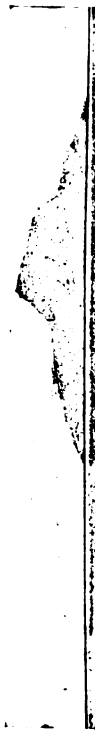
Baluran mountains.

Tanjong Sedano

*Lighthouse, Dairen island,
bearing 180° true, 6 m.*

Java, east coast, northward of Bali strait.

Tanjong Chandiban.



Mt. Ikan, bearing 185° true.

Bali strait.

Mt. Pongking.

High land W. of Tanjong Tanjung.

Giti Raja

Rangkah shoal.

Giti Pandan.

*Tree on Giti Dua,
bearing 80° true, 4 m.*

Giti Gilingan.

Madura, south coast. Bunder road, western approach,

Chart 3726, Bali strait. Var. 1° 50' E.

dries at low water. The reef is steep-to with 45 to 70 fathoms near the edge.

A detached coral patch, covered by $5\frac{1}{2}$ fathoms water, lies at half a mile south-eastward of the island.

LIGHT (*Lat. 8° 2' S., Long. 114° 27' E.*).—A *white flashing light every three seconds*, showing a flash of *one second* duration, is exhibited, at an elevation of 55 feet above high water, from a white iron frame tower 30 feet in height, situated near the centre of Duiven island. It is visible from a distance of 12 miles. The keeper's house is of stone with a red roof, standing 165 yards west of the lighthouse.

Directions.—The passage to the eastward of the island is preferable because of the dangers on the Java coast; but in light and favourable breezes the western passage may be adopted for the sake of obtaining anchorage north-north-west of the island in 40 fathoms, or in 20 fathoms closer in-shore, avoiding the reefs.

Going out by the western passage, if overtaken by the contrary stream before reaching the northern anchorage, vessels are better able to fetch the anchorage southward of Watudadal.

Tanjong Bansering may be recognised by a small white telegraph cable house near the point. A bank which dries at low water and has several trees on it, causing it to look like a chain of islets, extends a quarter of a mile east of the point, and $1\frac{1}{4}$ miles to the northward.

LEADING LIGHTS.—Rear light.—A *white fixed light* is exhibited, at an elevation of 91 feet above high water, from a white iron framework, 65 feet in height, situated near Tanjong Bansering. It is visible from a distance of 13 miles.

Front light.—A *red flashing light every three seconds*, showing a flash of *one second* duration, is exhibited, at an elevation of 49 feet above high water, from a white iron framework, 42 feet in height, situated at a distance of 670 yards, 186° true, from the rear light. It is visible from a distance of 9 miles. For the arcs of visibility, *see* Light list and chart 3726.

The above lights in line, on the bearing 6° true, lead through the narrow part of Bali strait.

Watudadal and Mana bight anchorage.—Watudadal may be known by a bridge over a creek with a guard-house near it. Mana bight, $2\frac{1}{4}$ miles south of Watudadal, affords anchorage in 18 to 10 fathoms water, out of the current but in the eddies. There is

General charts 1654, 941b, 2759a.

Chart 3726, Bali strait. Var. 1° 50' E.

also anchorage, but closer in-shore, in the small bays to the southward of Mana bight as far as 2 miles northward of Banjuwangi, but it is difficult to reach this last anchorage with light winds if the vessel is not near the shore.

Beacon.—A beacon, marked “position approximate” on chart, is erected on Tanjong Bulusan, about 2 miles to the northward of Banjuwangi.

Plan of Banjuwangi road on 3726.

BANJUWANGI, the capital and only town of importance in the whole district of that name, is $6\frac{1}{2}$ miles southward of the narrows of Bali strait. The district for which it is the outlet, and which includes the whole of the eastern divisions of the Residency of Besuki, is the most mountainous and thinly populated in the island, but the soil is very fertile, and, besides cloves, good crops of coffee and tobacco are raised. The climate is said to be very hot and unhealthy owing to the town being shut in by lofty mountains in rear. The town is not always readily distinguished in the afternoon when the sun is behind it; a good guide then is the Bakungan mountains, a triple-topped range on the Bali shore, from which the town bears 270° true. Fort Utrecht stands on the west side of the river, which can only be used by praus at high water.

There is a jetty for the use of small vessels.

The chief exports are coffee and sugar.

LIGHTS (*Lat. $8^\circ 13' S.$, Long. $114^\circ 23' E.$*).—From a white iron framework, 46 feet high, east of Utrecht fort, is exhibited, at an elevation of 47 feet above high water, a *white flashing light every fifteen seconds*, showing a flash of *three seconds* duration, which should be seen from a distance of 10 miles.

A *fixed red light* is exhibited, at an elevation of 24 feet above high water, from a white iron framework, 19 feet high, 300 yards, 108° true, from the above light, and should be seen from a distance of 3 miles.

The two lights in line, 288° true, mark the southern limit of the anchorage; vessels are prohibited anchoring southward near the telegraph cables, for a distance of 3 miles from shore.

Beacons.—A beacon, with a black and white vertically-striped topmark, is situated 128 yards, 87° true, from the chimney of Sukawidi sugar factory.

Two white iron beacons with conical topmarks, 184 yards apart, stand northward of the eastern lighthouse; the beacons (and lighthouse) in line, 191° true, lead through the north fairway to the inner roadstead.

REEFS AND BUOYS.—**North rock**, about $1\frac{1}{2}$ cables in length in a north-east and south-west direction, and with a least depth of $1\frac{1}{2}$ fathoms over it, lies $5\frac{1}{2}$ cables, 64° true, from Sukawidi sugar fac-

General charts 3726, 1654, 941b, 2759a.

Plan of Banjuwangi road on 3726. Var. 1° 50' E.

tory chimney. It is marked by a white conical buoy with staff and ball on its southern side.

A small patch of $2\frac{3}{4}$ fathoms lies half a cable to the eastward.

A coral patch, with a least depth of $3\frac{1}{4}$ fathoms over it, lies on the eastern side of the north fairway, 104° true, distant $4\frac{1}{4}$ cables from Sukawidi sugar factory, and is marked on its north-western edge by a black conical buoy.

A reef with $3\frac{1}{2}$ fathoms water, situated about one cable west-south-west of the above patch, and on the western side of the fairway, is marked by a white conical buoy.

Deptford rocks are two patches extending nearly 4 cables in a north and south direction, and about three-quarters of a cable in width, with a least depth of $1\frac{1}{2}$ fathoms over them.

The northern patch is marked on its northern side by a black can buoy surmounted by a truncated cone.

A white light-buoy, showing a *green fixed* light, is moored on the southern side of the southern Deptford rock.

Close to the westward of the northern Deptford rock is a 2-fathoms patch marked on its southern side by a black conical buoy.

About $1\frac{1}{2}$ cables to the southward of the Deptford rocks is a bank of $3\frac{1}{4}$ fathoms, marked by a red conical buoy moored at a distance of $4\frac{1}{2}$ cables, 60° true, from the lighthouse.

New bank, one cable to the southward of the last shoal, has a depth of 4 fathoms over it, and is marked by a conical buoy with black and white vertical stripes and ball topmark. About one cable to the southward and south-westward are depths of $4\frac{1}{4}$ and $3\frac{3}{4}$ fathoms, respectively.

Ommen shoal (Cameleon rock) (*Lat. $8^\circ 12' S.$, Long. $114^\circ 24' E.$*), half a mile to the eastward of the southern Deptford rock, is a small coral patch with 3 fathoms water over it. A white conical buoy with staff and ball is moored on its north-western side. Half a cable north-west of the buoy is a depth of 4 fathoms.

Crocodile reef (Kaiman), with $3\frac{1}{4}$ fathoms water, lies 4 cables, 112° true, from the lighthouse, and is marked on its northern side by a black can buoy surmounted by a truncated cone.

De Groots rock, of $2\frac{3}{4}$ fathoms, is $3\frac{1}{2}$ cables to the south-westward of Crocodile reef, and is marked by a black can buoy surmounted by a truncated cone moored on its northern side. The telegraph cable passes northward of this rock.

General charts 3726, 1654, 941b, 2759a.

Chart 3726, Bali strait. Var. 1° 50' E.

Pakem reef, with $2\frac{1}{2}$ fathoms water, lies $2\frac{1}{2}$ miles, 166° true, from the lighthouse; a black can buoy surmounted by a truncated cone is moored on its eastern side.

Bromo rock, with 6 fathoms of water over it, lies $2\frac{1}{2}$ miles, 147° true, from Tanjong Pakem, and about a mile to the southward, is a patch of 8 fathoms.

Plan of Banjuwangi road on 3726.

Pilot.—A pilot for vessels entering the inner anchorage can be obtained at Banjuwangi.

Directions.—To enter the road from northward the land immediately south of Tanjong Pakem should be kept in view open of the point, and the shore not approached in less than 15 fathoms water until the lighthouse (*Lat. $8^\circ 13' S.$, Long. $114^\circ 23' E.$*) near Fort Utrecht bears 271° true, when the outer anchorage may be steered for. Attention must be paid to the tidal streams which, near the shore, are much less strong and sometimes run in a contrary direction to those in the strait. With a fair wind, vessels may pass mid-channel between Deptford and Ommen rocks; in this passage Tanjong Pakem should be kept well open of the foot of Mount Ikan.

To reach the inner anchorage from the northward the chimney of Sukawidi sugar factory may be steered for when in line with the beacon with a black and white vertically-striped topmark, on the bearing 267° true, till the beacons with conical topmarks near Banjuwangi are in line on the bearing 191° true, which course leads to the anchorage.

In approaching Banjuwangi from the southward, care must be taken not to approach too close to Tanjong Pakem, as a reef extends out three-quarters of a mile from the point, and is marked by a black buoy with truncated cone topmark.

Anchorage.—The road, limited by reefs described further on, affords good anchorage for a small number of vessels during the north-west monsoon in from 7 to 9 fathoms a quarter of a mile from the shore, but the strong winds and heavy surf of the south-east monsoon render it advisable for sailing ships to anchor at a greater distance off at that season, in 16 to 20 fathoms.

Population.—In 1905, the population of Banjuwangi was 18,732, including 156 Europeans and 569 Chinese.

Tides.—*See* page 152.

Telegraphs.—Submarine cables are laid from Banjuwangi to Port Darwin and Roebuck bay, Australia; and to Singapore; in addition, Banjuwangi is the terminus of the International land line of telegraph, *viâ* Surabaya to Batavia.

Communication.—A vessel of the Netherlands India Steamship Company from Surabaya and intermediate ports calls at Banjuwangi fortnightly.

General charts 3726, 1654, 941b, 2759a.

Plan of Banjuwangi on 3726. Var. 1° 50' E.

There is also railway connection with Surabaya.

Supplies.—Fresh provisions are abundant, and moderate in price; water is brought from the hills by an aqueduct to the shore just above low water mark, but it is difficult to get it off in the south-east monsoon, and, owing to its open course near the harbour, is not good for drinking purposes.

Coal.—A small supply of coal can generally be obtained in emergency from the Naval coal depôt, but as the coal store is a considerable distance from the loading place, only about 50 tons can be shipped a day.

Chart 3726, Bali strait.

Coast.—From Tanjong Pakem the coast trends 192° true for 12 miles to Pangpang, and is fronted by a sandbank; the chart shows the 5-fathoms line at about 1½ miles from the shore. A rock is charted 7 miles southward of Tanjong Pakem and 8 cables off-shore; its existence is doubtful.

Anchorage may be obtained all along the coast between Tanjong Pakem and Mount Ikan in 7 or 8 fathoms 1½ miles from the shore.

Plan of Pangpang bay on 2732.

Mount Ikan, 13½ miles 177° true from Banjuwangi, is an isolated flat-topped bluff 763 feet high, at the extremity of a low isthmus forming the eastern side of Pangpang bay. Seen from a distance it appears like an island. View at page 154.

Pangpang bay (*Lat. 8°27' S., Long. 114°22' E.*) affords anchorage in smooth water in both monsoons; the depth is 10 fathoms at the entrance, decreasing regularly to 3 fathoms 2 to 3 miles within. The eastern shore is fringed by a narrow reef of coral and mud; the western and southern shores are fronted by extensive mud-flats.

Tides.—Spring tides rise here from 6½ to 8 feet.

Chart 3726, Bali strait.

Coast.—From Mount Ikan the coast runs south-south-east for 10 miles to Banju Biru bay, and then south-east, with a few salient points as far as Tanjong Slokah, the eastern point of Java.

Anchorage.—Banju Biru bay affords good anchorage in both east and west monsoons close to the shore, in about 20 fathoms water.

Tanjong Slokah is a low point on the eastern extreme of Blambangan peninsula. A reef, extending about a mile, fringes the coast here and continues as far west as Tanjong Purwa.

The peninsula is uninhabited and covered with an almost impenetrable forest. The land rises gradually from the sea to 1,181 feet without a single conspicuous summit.

Prince of Orange bank, nearly in the middle of the southern entrance to Bali strait, affords anchorage in case of calm or contrary

General charts 1654, 941b, 2759a.

Chart 3726, Bali strait. Var. 1° 50' E.

tidal stream. It is about 2 miles in diameter, with soundings of from 6 to 24 fathoms, black sand mixed with stones and shells.

Plan of St. Nicholas bay on 2732.

BALI SHORE.—**Menjangan or Hertenbeest island**, 236 feet high, very near the north shore of Bali, and about 5 miles distant from the entrance of the strait, is surrounded by a coral reef which projects a considerable distance from the western end, and dries at low water. Between the island and the Bali shore there is a narrow channel with a depth of from 6 to 15 fathoms water, but partly blocked by a patch of 3 fathoms near the Bali side.

St. Nicholas bay and the coast of Bali to the eastward will be described in Chapter VIII.

Chart 3726, Bali strait.

Tanjong Pasir (*Lat. 8° 6' S., Long. 114° 26' E.*), the north-west point of Bali island, is fronted by a reef extending a quarter of a mile. About 2 miles south of Tanjong Pasir, and near the entrance to Gili Manuk bay, is a reef extending one cable from Tanjong Batu Lichin, with a wreck on it.

Gili Manuk bay is 3 miles south of Tanjong Pasir. The entrance is about a ship's length in width and $1\frac{1}{2}$ fathoms deep; the south point is low, with cocoanut trees. Within the bay there are two islets surrounded by a flat of mud and sand. The northern shore of the bay is lined by a bank, and the depth between it and the islets is 4 fathoms. The southern shore is clear, and the depth on that side is 2 to 4 fathoms; the head of the bay is very shallow. Water can be obtained from a well at the head, but only in small quantities.

Tides.—The range of tides is about 9 feet, the streams running round the islets with great velocity.

Coast.—From Gili Manuk bay the coast trends in a south-easterly direction for 17 miles to Tanjong Pengambangan (Jembrana), which is bordered by a reef extending half a mile off its southern side.

Chandi Kesuma lies about 9 miles south-south-east from Gili Manuk bay, and is connected by a good road with the village of Negara, some 4 miles in the interior. On a small hill close by the shore is a white stone pyramid, 43 feet in height.

Anchorage may be obtained in 5 or 6 fathoms, over sand, with the white pyramid bearing 34° true.

Shoal.—A shoal, with 2 fathoms water over it, lies one mile to the westward of Chandi Kesuma, with the white stone pyramid bearing 62° true.

General charts 3726, 1654, 941b, 2759a.

Plan of Chupel road on 3726. Var. 1° 50' E.

Chupel road is a small bight in the reef 2 miles north-westward of Tanjong Pengambengan; the water deepens gradually from the shore, and there are 5 and 6 fathoms, sand, from 2 to 5 cables off. The road is with Mount Ikan, on Java, bearing 246° true, and a white beacon, on Bali, 66° true.

Reefs and buoys.—The following dangers exist in Chupel road:—

A reef, with 3 feet of water over it, at a distance of 6 cables, 223° true, from the white beacon. A white conical buoy marks its western side.

A reef, which dries at low water, at a distance of $2\frac{3}{4}$ cables, 234° true, from the white beacon. A white conical buoy is moored on its north-western side.

A reef, which dries at low water at a distance of $3\frac{1}{4}$ cables, 268° true, from the white beacon. A black can buoy marks its western side.

Chart 3726, Bali strait.

Kali Jembrana, of considerable size, said to be navigable by small schooners, falls into the sea about a mile east of Tanjong Pengambengan.

Coast.—From Tanjong Pengambengan the coast trends east-by-south for 14 miles to Pulukan road, and then south-east for 27 miles to Pantai Barat. It is bordered along this last stretch by a reef with a great surf on it, which is, however, the only danger, and in calm weather vessels may anchor along it in from 12 to 18 fathoms. This facility of anchoring, together with the tolerably regular land breezes, make it easy to work along the shore in the south-east monsoon.

Plan of Pulukan road on 3726.

By the mouth of the Kali Pulukan is a break in the coast reef affording shelter for praus and a good landing place. It can be recognised by the Controleur's house with red roof.

Plan of Pantai Barat on 3726.

Pantai Barat.—Pantai Barat is a large bay between Tanjongan and Tanjong Mebulu (*Lat. 8° 50' S., Long. 115° 5' E.*), the west point of Tafelhoek; it is divided into two smaller bays named Labuan Kuta and Labuan Jimbaran by a low outstretching piece of coast fronted by a reef which projects one mile off. About 2 miles to the south-eastward of Tanjongan is a conspicuous temple, and another temple is situated on Tanjong Mebulu.

Anchorage.—Labuan Kuta, the northern bay, affords anchorage in 5 fathoms about one mile from the shore. In the southern part of this bay is a reef with $2\frac{1}{4}$ fathoms over it and separated from

General charts 3726, 1654, 941b, 2759a.

Plan of Pantai Barat on 3726. Var. 1° 50' E.

the shore by a narrow channel with 4 to 5 fathoms water. The shore is lined with breakers, and the heavy swell that rolls in renders it advisable to veer to 40 fathoms of cable. The village of Kuta is about $1\frac{1}{2}$ miles inland.

Labuan Jimbaran, the southern bay, has anchorage in 6 to 8 fathoms, sand and mud, sheltered from south-east winds, but there is little or no protection from the heavy ground swell that rolls in from the south. These rollers often cause cables to part and vessels to leave the road; it is, therefore, advisable not to moor.

Tides.—It is high water in Labuan Jimbaran, at full and change, at XIh. Springs rise $9\frac{1}{2}$ feet.

Chart 3726, Bali strait.

Tafelhoek (Table cape) is a peninsula of high land bordered by a high broken cliff and a few small reefs. Though about 700 feet high it may be styled low in comparison to the adjacent mountainous country. The western part, Tanjong Mebulu (Bukit) (*Lat. 8° 50' S., Long. 115° 5' E.*), is the higher and bolder, the eastern part tapering into a low point off which are Nusa Dua, two small islands on the coast reef. Soundings of 20 fathoms may be found west and south of the west cliff at a distance of a mile.

The isthmus that joins Tafelhoek to the main island is but a mile in width; on it there are two villages, Kuta (above mentioned) to the north, and Tuban to the south-east. On both sides there are anchoring roads, Pantai Barat is used during the south-east monsoon, and Pantai Timur, page 213, on the east side, during the north-west monsoon.

Supplies.—Great quantities of rice are exported from this place to Singapore and China, also coffee and tobacco. Cattle and poultry are procurable; water can be obtained from near the flagstaff in Pantai Barat.

Chart 1654, Island of Java, eastern portion.

MADURA ISLAND, which from its proximity and geological formation constitutes almost an integral part of Java, has a length of 87 miles, and an average breadth of 20 miles, except towards the eastern extremity, which ranges from 12 to 3 miles in width. The south coast of the island is separated from Java by Madura strait, and the western end by the narrow strait of Surabaya. The surface of the island is undulating, but nowhere mountainous, the hills in the western portion of the island seldom exceeding 700 feet in height, while those in the eastern portion range between 1,000 and 1,565 feet. The eastern extremity is the best cultivated, rice, maize, and tobacco being grown in considerable quantities. The north coast is bold and safe, with regular soundings and good holding ground in $3\frac{1}{2}$ to 5 fathoms one mile from the shore. The south coast is fringed by

General charts 1654, 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 1° 40' E.

shoals, islets, and mudbanks, and the shore must be approached with caution. In 1905 the population was about 1,493,000.

South coast.—From Tanjong Gumung (page 139) the coast trends generally east for 9 miles to Tanjong Batu Putih. The shore along this stretch is fringed for the greater part by a rocky bank half a mile wide, which dries at low water, and is fronted by the great mudbank of less than 3 fathoms water, which fills up the eastern entrance to Surabaya strait.

Hills.—The most remarkable hills in this neighbourhood are Mounts Kemiri, Sereng, Seleret, and Telok; Mount Seleret is the most noticeable, and is formed of four smaller peaks 767 feet high. Eastward of these hills is Telok, a jagged mountain 870 feet high, and further east again Lajing hills and Mount Sandangan, both of the same height as Telok. Lajing shows no remarkable peak. Sandangan has an undulating surface covered with wood, it rises 8 miles 12° true from Tanjong Batu Putih.

Tanjong Batu Putih (*Lat. 7° 13' S., Long. 113° 9' E.*) is a rocky precipitous point and wooded, the tops of the trees being 100 feet above the water; the soil forming the point is of a light colour.

A sand-spit, formed by detritus brought down by Kali Balega, extends 4 miles out from the point in a south-south-easterly direction; the greater part of this bank dries at low water. The edge is steep-to, with soundings of 6 to 9 fathoms near it, the depths at the extremity decreasing rapidly from 18 to 2 fathoms.

Kali Balega, which discharges itself east of Tanjong Batu Putih, is navigable by large praus, which, however, can only enter at high water, as the bar formed by the above-mentioned bank dries at low water.

Sampang, the seat of the Assistant Resident of the province, is about a mile inland, 5 miles east of the river, and contains a population of about 9,000. It is of little importance; the only article of export is salt obtained from salt pans in the neighbourhood. The town is not visible from the offing, the harbour office being the only building on the shore.

Anchorage, in 8 to 10 fathoms, mud, can be obtained at 1½ miles from the shore, with the harbour office bearing 339° true, and a bare tree on a hillock east of the town bearing 23° true. During the south-east monsoon vessels anchor under Kambing island, page 141.

Coast.—From Tanjong Batu Putih the coast trends eastward for 22 miles to Tanjong Padelegan; it is fringed along this length by a sandbank which extends over a mile from the shore for the first

General charts 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 1° 40' E.

10 miles east of the Kali Balega, and then closes in to half a mile from the shore for the remainder of the distance. Soundings show 6 to 8 fathoms near the edge of this bank, and anchorage may be had anywhere along it. The country in-shore is hilly to within 2 miles of Tanjong Padelegan, where it becomes low and marshy.

Hills.—In the interior of Madura two parallel ranges run east and west; the southern hides the base of the northern range, only the higher mountains, Kemiri, 1,411 feet, and Tambuku, 1,565 feet high, appearing above the nearer hills. These peaks are generally visible, even in the south-east monsoon.

Plan of Bunder road on 3312.

Tanjong Padelegan (*Lat. 7° 15' S., Long. 113° 32' E.*) is low, sandy, and indistinguishable from the offing; the shore bank extends 2 miles out from the point and is steep-to, the outer part of the bank consisting of soft brownish grey mud, but nearer to the shore of hard sand. The Kali Padelegan enters the sea just west of the point.

Tanjong Dato is a rocky wooded point, 54 feet high, 2 miles 68° true from Tanjong Padelegan. A bank of mud, sand, and shells extends from 2½ miles south of Tanjong Dato 8 miles, in an easterly direction, as far as the island Gili Dua, with a general depth on it of 3½ to 5 fathoms, but with several rocky shoals. South of Tanjong Dato this bank consists of soft mud, and the southern edge is steep-to, but the northern side is shelving.

Rangkah, one of the shoals on the bank extending from Tanjong Dato is a coral reef a third of a mile long, with a small white sand cay on it always visible above water; the shoal lies 3 miles, 290° true, from Gili Dua; the channel between them has a depth of 3 to 4½ fathoms.

Belukaran is a similar reef, but smaller than Rangkah, from which it lies 304° true, distant one mile. Between Belukaran and Tanjong Dato there are several rocks which dry at low water.

ISLANDS.—Fronting the bay between Tanjongs Dato and Tanjung is a chain of islands, the westernmost of which, Gili Dua, is on the bank projecting from Tanjong Dato.

Gili Dua and Gili Pandan are low islets covered with brushwood, on a reef extending north-east 1¾ miles, and nearly half a mile wide, forming a breakwater for the anchorage described on page 165. The islands are barely 2 feet above high water, but there is a tree 23 feet high on the eastern side of Gili Dua which can be seen 6 miles.

Gili Wutak, 97° true, from Gili Pandan, is a small low flat coral islet, one cable in length, surrounded by a reef which extends 2 cables

General charts 1654, 941b, 2759a.

Plan of Bunder road on 3312. Var. 1° 50' E.

to the southward and dries at low water, with 4 to 6 fathoms at its edge. The islet is only 2 feet above high water, but two trees on it can be seen at a distance of 6 miles. In the channel between Gili Wutak and Gili Pandan the depth is from 5 to $6\frac{1}{2}$ fathoms.

Gili Gilingan, $1\frac{1}{2}$ miles, 108° true, from Gili Wutak, is a wooded islet, a quarter of a mile in length, and 55 feet high, surrounded by a reef about a cable wide and steep-to, with 6 to 10 fathoms near the edge. The channel between Gili Gilingan and Gili Wutak is clear, with a least depth of 7 fathoms.

Guntur rock (*Lat. $7^\circ 17' S.$, Long. $113^\circ 45' E.$*), $1\frac{1}{2}$ miles, 147° true, from Gili Gilingan, is a small round coral patch, 2 cables in diameter, a small part of which dries one foot at low water springs. It stands in 13 fathoms water, and when covered can generally be seen by discoloration over it.

Gili Rajah, $3\frac{3}{4}$ miles in length, east and west, is well wooded and fertile; the south side is 180 feet high to the tops of the trees, and the shore on that side is steep-to; the north side of the island slopes down to low marshy land with a shelving shore in which there are fish-ponds. A reef surrounds the island, being very narrow to the southward and westward, but extending a half to one mile from the north and east sides. The channel between Gili Rajah and Gili Gilingan is clear, with soundings of 12 to 10 fathoms.

Buoy.—A black can buoy is moored at a distance of 8 cables from the eastern point of Gili Rajah and marks the extremity of the reef.

Bunder road.—From Tanjong Dato the coast trends north-north-east for 7 miles, and then east for 18 miles as far as Tanjong Tanjung, forming a wide bay, little frequented except by vessels which come to load with salt from Kali Bunder, which enters the bay 2 miles north of Tanjong Dato. This river is about 40 yards wide and 2 fathoms deep at the entrance, which, however, is fronted by a bank of mud and sand a mile wide, on which there is only one foot depth at low water. A white conical buoy is moored off the entrance, and the north bank of the channel is marked by black posts for the use of praus which carry salt to vessels in the road. Neither good water nor supplies are procurable.

Pamekasan, the seat of the Resident of Madura, is 5 miles inland from the mouth of Kali Bunder, and has a population of about 8,000.

Anchorage.—During the north-west monsoon there is sheltered anchorage off the mouth of Kali Bunder, as close under the coast as the draught will allow; 3 miles from the shore the depth is only 4 fathoms, mud. During the south-east monsoon a sea sets in and the above anchorage is no longer safe; vessels then anchor one mile west-

General charts 1654, 941b, 2759a.

Plan of Bunder road on 3312. Var. 1° 50' E.

ward of the north point of Gili Pandan, in 3 to 5 fathoms, mud and sand, sheltered from the wind, but exposed to a swell, after a gale on the Java coast.

Tides are similar to those in Madura strait, page 143. Springs range 7 to 8 feet, neaps 2 to 4 feet.

Tidal streams.—At Kali Bunder anchorage the flood stream sets west-north-west, and the ebb to east-south-east, with a maximum velocity of 2 knots. At Gili Pandan anchorage the flood stream sets to the west, and the ebb north-east.

Directions for Bunder road.—From a position about 3 miles south of Tanjong Dato, in 9 to 12 fathoms, Gili Rajah alone of all the islands fronting the coast is distinctly seen, and the tree of Gili Dua is visible just above the horizon, standing out darkly against Gili Rajah; from this position a course 75° true should be steered, for the high trees of Gili Rajah, until Rangkah shoal bears 1° true, thence 35° true over the outer roadstead in order, in the western monsoon, to work up to the anchorage before the mouth of the river. View at page 154.

Vessels drawing more than 16 feet cannot at low water cross the bank, and may take the channel between Gili Wutak and Gili Gilingan by keeping on eastward from a position 4 miles south of Tanjong Dato until the south-east point of Gili Rajah is in line with the south side of Gili Gilingan 78° true, which will lead half a mile clear of the reef of Gili Dua, and when the two trees of Gili Wutak bear 350° true steer a mid-channel course between Gili Wutak and Gili Gilingan.

From Surabaya, in the eastern monsoon, sailing vessels should keep near the Java coast, where the land wind is strongest, as far as Panarukan; then stand across for the Madura side.

Plan of Sapudi strait on 934.

Tanjong Tanjung (*Lat. 7° 8' S., Long. 113° 54' E.*) is low, rocky, covered with trees, and steep-to, with 3 fathoms at 2 cables distance. The land slopes upwards from the point to a range of wooded hills 340 feet above the sea, forming the eastern extremity of the southern range. Between Kali Bunder and Tanjong Tanjung the coast is fronted by a shelving bank, the 3-fathoms line running at a distance of 2 miles from the shore along the greater part of this stretch. Several small villages stand on the shore, and a few unimportant rivers enter the sea.

Gili Genting consists of two masses of high land connected by a low narrow neck which gives it the appearance at a distance of two separate islands. The northern part is 3 miles long east-north-east and 125 feet high to the tops of the trees; it is wooded and thickly populated. At the principal village, Aeng Anjar, on the north side,

General charts 1654, 941b, 2759a.

Plan of Sapudi strait on 93½. Var. 1° 50' E.

there is a well of good water. The southern part, Kuripan, is 66 feet high to the tops of the trees, with rocky sides and steep-to. The whole island is surrounded by a reef which dries. This reef is narrow on the south side, except in the bight off the low neck; on the west side it extends to 4 cables from the coast.

Depths of 5 fathoms are $1\frac{1}{2}$ miles, 277° true, from the south-west point of the island, and 3 fathoms, 260° true, three-quarters of a mile from the same point. On the east side of Gili Genting the reef extends to half a mile from the shore, and from the north-east point a sandbank stretches 2 miles east with a least depth of 5 fathoms.

Buoy.—A white conical buoy marks the extremity of the reef on the west side of Gili Genting.

Gemer rock, three-quarters of a mile, 60° true, from the north-east point of Gili Genting, is of coral, 4 cables long, and partly dries at low water springs. Between Gemer rock and the Gili Genting reef, the depth is from 4 to 9 fathoms.

Noko rock, $1\frac{1}{2}$ miles, 327° true, from the north-east point of Gili Genting, is a patch of white coral 2 cables in length, always visible above water, standing on a reef almost circular, a third of a mile in diameter, which dries at low water. This reef is steep-to on all sides except the western, in which direction a sandbank with 6 fathoms water projects 6 cables. The channel between Noko reef and Tanjong Tanjung is a mile wide, with depths of 6 to 11 fathoms, mud, sand, and shells.

Anchorage.—During the south-east monsoon there is safe anchorage off Aeng Anjar village on the north side of Gili Genting, 4 cables off-shore, in 7 fathoms, mud.

Berg rock, $2\frac{1}{2}$ miles, 68° true, from the south-east point of Gili Genting, is a circular patch of coral 2 cables in diameter, covered by 10 feet at low water, steep-to, with 13 fathoms around.

Gili Lawak (*Lat. $7^\circ 12' S.$, Long. $114^\circ 2' E.$*) is a low flat coral island, 3 cables long north and south; wooded, with the tops of the trees 72 feet above water, and surrounded by a reef which extends from the east side 4 cables out and dries at low water. On the north side of the island there is a triangulation pillar of white masonry. From this pillar Tanjong Sarotak bears 13° true, distant $5\frac{1}{2}$ miles.

Kokop reefs are two small coral reefs lying 2 miles, 260° true, and $1\frac{1}{2}$ miles, 265° true, respectively, from Gili Lawak. They are each about half a mile in diameter and dry 2 or 3 feet at low water; steep-to, the depth around being 15 fathoms.

Puteran island is only separated from Madura by a narrow channel. It is a wooded island, 8 miles long east and west, and 2 miles

General charts 165½, 941b, 2759a.

Plan of Sapudi strait on 934. Var. 1° 50' E.

broad, somewhat steep-to on the south side, but on the north side sloping downward towards the coast which is low and even marshy in some places. This north coast forms the southern side of a great bay, which on account of its slight depth of water is of little importance to navigation, though for a small craft it affords access to Sumenep bay, through the narrow strait of Kalianget. A range of hills traverses the south side of the island throughout its length, the highest of these are Chabia hill, 341 feet high, to the westward, and Mojopait, 427 feet high, to the eastward. The hills slope down evenly to the south-east point of the island, Sarotak, which is readily distinguishable by a conspicuous tree over some graves close to the point. The island is bordered by a reef of less than half a mile in width, but off Tanjong Sarotak this reef is very narrow and steep-to, the depth at 2 cables from the point being 7 fathoms. The principal town on the island is Talangu on the north-west shore, opposite Kalianget; the island is frequently called Talangu after this town. Puteran is a smaller town on the north shore.

Plan of Sumenep bay on 934.

SUMENEP BAY (*Lat. 7° 3' S., Long. 113° 56' E.*), west of Puteran island, is roughly square in form, shut in on three sides; the entrance between Tanjongs Padike, in Puteran, and Tanjung, in Madura, is $3\frac{1}{2}$ miles wide. The bay is nearly filled with a bank of soft mud, and the depth of the water within the entrance points is less than 3 fathoms, shelving gradually to the head.

Two rivers have their outlet in Sumenep bay; the Saroka in the western corner of the bay is formed by the confluence of two streams about a mile above the mouth; the depth within the river is from one to 2 fathoms, but on the bar at the entrance there are only 2 feet at low water. Kali Marengan has its origin near Sumenep town about 4 miles inland, and discharges in the north corner of the bay. The mouth is only 11 yards wide, and the channel is lost in the mudbank in front of the coast. The harbour office is near the left entrance of this river. The coast between the two rivers is low and marshy, and consists chiefly of salt pans, from which the principal export of the place is derived.

Kalianget, on the point of Madura, opposite Talangu, is the shipping port of Sumenep, being connected by a broad carriage road. Native boats load and discharge at a stone mole.

Communication.—A steamer of the Netherlands India Company calls here fortnightly on the way from Surabaya and Panarukan to Banjuwangi, and again on return.

General charts 1654, 941b, 2759a.

Plan of Sumenep bay on 934. Var. 1° 50' E.

Supplies.—Meat is abundant and cheap, vegetables scarce; water can be procured at Kalianget, and also from wells at Tanjung, and from Aeng Anjar in Gili Genting.

Trade.—Sumenep bay is visited yearly by about 150 sailing vessels, including schooners, and by a few steam vessels. The exports are cocoanuts, ground-nut oil, and salt. The imports are rice and maize.

Anchorage.—During the north-west monsoon there is good anchorage in 4 fathoms, mud, with Tanjong Tanjung bearing 237° true, distant 1½ miles, but during the south-east monsoon this anchorage is not secure, and then vessels anchor north of Gili Genting.

Tides.—The highest tides occur about XIh. a.m. in July, and XIh. p.m. in December. Springs rise 6 to 7 feet, neaps range 3 to 4 feet. The diurnal tide predominates, and a second tide is seen at times.

Tidal streams follow the direction of the channel in Kalianget strait, flood east, ebb west, about 1½ knots. In the south-east monsoon the flood commences after the water has risen considerably, the ebb turns at high water. In the north-west monsoon flood begins at low water, the ebb 3 hours after high water.

In Gili Genting road the flood stream sets west-south-west, and the ebb stream towards east-north-east; the greatest velocity is one knot.

Off Tanjong Sarotak (*Lat. 7° 6' S., Long. 114° 4' E.*) the flood is south-west, and the ebb north-east, with greatest velocity 2 knots.

Directions.—Vessels bound for Sumenep bay from Surabaya usually pass between Gili Genting and Gili Rajah, and between Tanjong Tanjung and Noko reef. The passage from Sumenep bay into the inner anchorage of Kalianget is marked by 3 beacons with black truncated cones, on the port hand, and 3 beacons with white balls on the starboard hand. The least water at lowest springs, in July and December, is 9 feet, at the outermost beacons; the bottom being soft mud.

The best anchorage is in 7 to 8 fathoms just within the inner beacon. In the north-west monsoon, heavy squalls may be expected.

Plan of Sapudi strait on 934.

Bay north of Puteran island.—The great bay between Puteran island and the east point of Madura is filled by a flat of sand and mud with a depth of one to 2 fathoms over it. Close to the coast of Madura there is a depression of 3 to 6 fathoms, but being closed at both ends it is useless for navigation.

Chart 1654, Island of Java, eastern portion.

NORTH COAST OF MADURA.—The north coast of the island stretches nearly due east from Tanjong Modung in an unbroken line for 65 miles as far as the rounded point formed by the slopes of

General charts 1654, 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 1° 40' E.

Mount Buruan, thence it trends east-south-east for 13 miles to Tanjong Lapa. The coast is hilly along the whole distance, a range running parallel with the shore about $2\frac{1}{2}$ miles inland, gradually increasing in height to the eastward, and during the south-east monsoon presenting a uniformly dry and barren aspect with few spots of cultivation.

The whole extent of the coast is perfectly clean and can be approached with safety except near the east point, Lapa. The depth increases gradually off-shore; at a distance of half a mile soundings show 5 fathoms, at 3 to 4 miles 15 fathoms, and at 8 miles 25 fathoms. The bottom affords good holding ground everywhere, consisting of soft mud; within the 5-fathoms line sand is mixed with the mud.

Coast hills.—The most noticeable hills in the coast range are Berukung hill, 751 feet high, about 17 miles east of Tanjong Modung; Batu Puti hill, 696 feet high, 4 miles further east; Mount Kumbang, a flat-topped hill, 935 feet high, and Mount Buruan, an isolated mountain 1,073 feet high. The higher range of hills further inland is rarely visible, and presents no noticeable peaks. In clear weather the high mountains of Java can be seen over the Madura hills.

Tanjong Modung (*Lat. 6° 54' S., Long. 112° 49' E.*), the north-west point of Madura, is low, covered by vegetation, and surrounded by flats in which there are many fish-ponds; two round-top trees stand on the extreme west point. Eastward of the point there is a small bay, mostly dry at low water.

Ketapang, 28 miles east of Tanjong Modung, is a town of some importance, and the residence of the chief of the district. It stands at the junction of the coast road and the road going south to Sampang. All the towns on the north coast of Madura are connected with each other by a well-kept carriage road, which for the most part runs close to the coast.

Water.—In a small bay $1\frac{1}{2}$ miles east of Ketapang there is a good place for watering where boats can get close in near a waterfall which tumbles into the sea from a height of 35 feet.

Ambunten, 27 miles east of Ketapang, is also the residence of a district chief. The coast begins about here to trend a little to the northward of east round Mount Buruan, an isolated mountain with a rugged crest, and then bends round to Tanjong Lapa.

Plan of Sapudi strait on 934.

Tanjong Lapa, the east point of Madura, is a low promontory covered with palms and bordered by a reef which extends one mile to the eastward, and is prolonged to the north-west by a ridge of sand $2\frac{1}{2}$ miles long parallel with the coast, with a minimum depth of

General charts 1654, 941b, 2759a.

Plan of Sapudi strait on 934. Var. 2° 0' E.

1½ fathoms over it. The coast here should not be approached within 2 miles.

Giliang, 2½ miles east of Tanjong Lapa, and 115 feet high, is a rocky island 2½ miles long, north and south, and 1½ miles broad. The west side of the island is bordered by a reef one cable wide, which dries at low water. The east side is steep-to. A bank with less than 5 fathoms over it extends 1¼ miles south of the island. No supplies can be obtained at Giliang; water is brought from Sumenep.

Giliang strait, between Giliang and Tanjong Lapa, is clear with the exception of a rock in mid-channel covered by 4 fathoms; between this rock and Giliang the channel is three-quarters of a mile wide and 6½ to 8 fathoms deep. A patch of 5½ fathoms is half a mile 12° true from the rock. Both these shoals will be cleared by steering a course N. 11° E., at a distance of 3½ cables from the west side of Giliang.

SAPUDI STRAIT, the channel between Sapudi and Giliang islands, is 7 miles wide, and is the usual track for vessels bound to Bali strait. It is a good and safe channel with no dangers beyond those of Tembaga and Jacoba Elizabeth rocks on the western side, and is preferable to either that west of Giliang or east of Sapudi.

Winds and currents.—In Sapudi strait and passages eastward, including Kangeang group, the south-east monsoon prevails from April to October, and the north-west from November to March. In April and May all winds are southerly, in June the monsoon becomes dominant from south-south-east to south-east, and blows with greatest strength during July, August, and September. In November winds are northerly, alternating with rain squalls from all points; in December north and north-west winds last longer and squalls come from north-west or west-north-west; January and February are marked by very squally weather from north-west to north, and in March it often continues to blow stiffly from west to west-north-west.

Currents run southward in the south-east monsoon, and northward in the north-west monsoon, causing a very troubled sea during the height of those seasons. In the open sea the wind currents are stronger than the tidal streams, and are accelerated or retarded by the latter, varying from three-quarters to 2 knots. In narrow channels and near the land no rule holds good, but the flood to north, and ebb to south, often prevail.

Tembaga rocks (*Lat. 7° 7' S., Long. 114° 8' E.*) form a group of three reefs occupying a space about 1½ miles in diameter. The western reef is 3½ miles, 97° true, from Tanjong Sarotak; it is of a round shape, 2½ cables in diameter, and dries 3 feet at low water springs. The

General charts 1654, 941b, 2759a.

Plan of Sapudi strait on 934. Var. 2° 0' E.

northern reef lies one mile, 80° true, from the western reef, and is over half a mile in length north-west and south-east, with a patch on its south-east part which dries 2 feet at low water springs. The southern reef is half a mile, 125° true, from the western reef; it is half a mile in length north-east and south-west, very narrow, and dries 2 feet at low water springs. All are steep-to, with depths of 15 to 22 fathoms around. The channel between these rocks and Puteran is clear, with depths of 6 to 9 fathoms.

Jacoba Elizabeth rock is a round coral rock 3 cables in diameter, with a least depth of 7 fathoms over it at low water springs, steep-to, having depths of 20 to 27 fathoms near. It lies $4\frac{1}{2}$ miles, 173° true, from the south point of Giliang island.

Sapudi island is about 9 miles in length north-west and south-east, and 5 miles across the widest part. It has a pleasant and fertile appearance, and rises to a height of 407 feet. A narrow reef surrounds it with deep water close-to.

LIGHT (*Lat. 7° 5' S., Long. 114° 16' E.*).—A *white flashing* light, showing a *flash of three seconds* duration followed by *twelve seconds* eclipse, is exhibited, at 192 feet above high water, on Tribung, the western point of Sapudi island, from a white iron frame lighthouse, 192 feet high; it is visible in clear weather at a distance of 20 miles.

For the arc of visibility, *see* Light list and charts.

Tribung is the landing place for goods and passengers during the south-east monsoon from April to October.

The anchorage is with the lighthouse bearing 90° true, in 16 to 18 fathoms water, about 2 cables from the edge of the reef; care is needed in approaching, as the reef north and south of the lighthouse projects farther from the shore.

Gayam, 6 miles south-east of Tribung, is a place of considerable local traffic, and contains the residence of the governor of Sapudi and the Kangean islands. A stone pier projects from the shore, with a conspicuous white-roofed cupola on the end; a passage for small vessels, through the reef southward of the pier, is marked by two beacons with red balls.

The anchorage is in 20 fathoms, mud, half a mile from the shore, with the pier cupola in line with the remarkable trees on the hill, 315 feet high, over the town, bearing 0°. This roadstead can only be used in the north-west monsoon.

General charts 1654, 941b, 2759a.

Plan of Sapudi strait on 934. Var. 2° 0' E.

Both Tribung and Gayam are unsuited to any prolonged stay; when the current and tidal stream coincide, strong eddies will cause great strain on the cables.

Tides.—It is high water, full and change, at Sapudi island, at Xh. 25m. Springs rise $6\frac{1}{2}$ feet.

Chart 1654, Island of Java, eastern portion.

Ra-as strait, to the eastward of Sapudi, is seldom used. It is 4 miles wide between Sapudi and Ra-as islands, and $6\frac{1}{2}$ miles wide between Sapudi and Payangan. In the centre of the channel the depths are 50 to 60 fathoms, and there are no known dangers. The strength of the current is greater than in Sapudi strait.

Payangan islet, $7\frac{1}{2}$ miles, 51° true, from the north point of Sapudi, is surrounded by a reef which extends three-quarters of a mile to the northward and westward of the islet, and half a mile to the southward and eastward, and dries at low water. A patch of $6\frac{1}{2}$ fathoms is $2\frac{1}{2}$ miles, 339° true, of Payangan; the bottom around appears to be foul and uneven.

Bulumanuk, $9\frac{1}{2}$ miles, 71° true, of the north point of Sapudi, is surrounded by a reef which extends one mile from the north side and half a mile from the other sides of the islet. A patch of $4\frac{1}{2}$ fathoms lies $1\frac{1}{2}$ miles north of the islet. In the channel between Bulumanuk and Payangan there are 8 and 11 fathoms, and one patch with 6 fathoms.

Koset rock (*Lat. $7^\circ 4'$ S., Long. $114^\circ 29'$ E.*), midway between Bulumanuk and the western point of Ra-as island, is about one mile in diameter, covered by 2 fathoms water, and is generally discoloured. From the shoalest part the western point of Ra-as island bears 184° true, distant $4\frac{3}{4}$ miles.

Ra-as island, 4 miles east of Sapudi, is about 9 miles in length east and west, the western part being 82 feet high and the eastern part 161 feet; the land between is low, and at a distance of 10 miles is dipped below the horizon, giving the appearance of two islands. A reef extends to $4\frac{1}{2}$ miles northward of Ra-as, with the islet Sarok on the northern part; the islet is overgrown with low trees, and encircled by a white beach. On the western side of the reef are some detached patches 39° true from the west point of Ra-as, the southern of these, $2\frac{1}{2}$ miles from the point, dries at low water.

North-westward of the reef is a shoal, about $4\frac{1}{2}$ cables long in a north-east direction, with a least depth of 4 fathoms, sand and stones; the west extreme of Ra-as island bears 216° true, distant 7 miles.

Anjer islet, $4\frac{1}{2}$ cables from the north-east point of Ra-as, small, round, and within the edge of the reef which dries at low water, is

General charts 1654, 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 2° 0' E.

seen at a considerable distance. Three-quarters of a mile, 11° true, from Anjer islet is a small reef, partly drying at low water, with 3 fathoms around.

Talango Ayer, Talango Tenga, Talango Timor, a chain of low uninhabited islands, surrounded by reefs, are 5 miles, 18° true, 5 miles, 45° true, and 5½ miles, 55° true, from the east point of Ra-as.

Tundu island, 2 miles east of Ra-as, has tall trees on the north-east point visible at a considerable distance; the island is enclosed by reefs which extend 7 miles eastward of Ra-as.

Anchorage.—In the south-east monsoon anchorage will be found outside the reef northward of Anjer. From the north Anjer should be steered for between the bearings 179° and 174° true, midway between Talango Ayer islet and the reef of Sarok, with Anjer open of the east point of Ra-as. When the south side of Talango Tenga bears 90° true steer for the west point of Tundu, and anchor in 14 fathoms, sand, with the north extreme of Ra-as, 271° true; the east extreme of Ra-as, 184° true; and the north-east point of Tundu, 124° true. As the stream here runs mostly against the wind, the anchorage is uneasy, and not suitable for a long stay.

In the north-west monsoon, it is necessary to anchor on the south-east side of Ra-as island. This temporary anchorage, in 4 or 5 fathoms, sand and stones, 4 cables from the dry edge of the reef, is reached by steering with the east point of Ra-as bearing 22° true until the steep point Batu Putih is 292° true. The reef is steep, rapidly shoals from 20 to 5 fathoms, and must be approached slowly.

Goa Goa island (*Lat. 7° 7' S., Long. 114° 46' E.*), 5½ miles, 68° true, from Tundu, is remarkable from the large number of stone and wood houses, and on the north-east point tall trees grow. At a distance the island may appear as two, and on approaching, many native boats will be seen at anchor.

Kamudi, a small round islet encircled by a white sand beach, is a mile north-east of Goa Goa.

Goa Goa and Kamudi islands are enclosed by reefs which project 2½ miles north-westward, with shallow water at the edge.

Islay rock, with a depth of 13 feet over coral, was struck upon in 1843 by the British ship *Islay*, and is reported to be 5 miles 125° true of Tundu and 5 miles 192° true of Goa Goa. The rock is known to the natives of neighbouring islands, but the position is doubtful.

Karang Takat, nearly midway between Kamudi islet and Kangeang island, is an extensive reef 10 miles in length in an east-

General charts 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 2° 0' E.

south-east direction, has only been partially examined, and is of doubtful position, being reported as 2 to 3 miles south-west of its place on the chart. On the reef are three sandbanks, 2 or 3 feet above water, Gemuk at the north-west end, Tenga near the centre, and Timor at the south-east end; in the south-east monsoon temporary huts of fishermen may be seen on Gemuk. The northern side of the reef is very steep, with no bottom at 40 fathoms within half a mile; the western end has been anchored on in 9 fathoms. In clear weather the discoloured water may be seen 4 miles, but the edge must be approached with great caution.

No soundings have been obtained in the channel west of Karang Takat, but it appears to be clear. The passage east of the reef is used by vessels bound to Makassar and Amboina during the south-east monsoon.

Adriana Petronella reef was grounded on by a Dutch ship of this name in 1854. It appeared to be about 80 feet long, with 13 to 16 feet water, and 56 fathoms close-to, and the water was not discoloured; the position is doubtful, and is given with the west point of Kangeang, bearing 112° true, distant 17½ miles.

Minerva rock, also of doubtful position, is stated to lie 14 miles, 322° true, from Mamburit island, at the north-west end of Kangeang.

Kemirian or Urk island (*Lat. 7° 5' S., Long. 115° 12' E.*) is of irregular form, thickly wooded, 154 feet high, and visible at a distance of 15 miles. It is surrounded by a steep coral reef which projects most to the westward.

The channel between Kemirian and Kangeang is 6 miles broad, quite safe, with soundings of 40 and 50 fathoms.

Directions.—Vessels bound from Gayam in Sapudi, to Ketapang bay in Kangeang, pass south of Sapudi, and into Ra-as strait, with Payangan island bearing 0° true until the remarkable tree on the south-east point of Sapudi bears 225° true; from here a course 45° true will lead between Koset rock and the 4-fathoms shoal, north-west of Sarok islet, and when the southern points of Payangan and Bulumanuk islands are in line, with Sarok closing the opening between Ra-as and Tundu, the course to the south point of Ketapang bay is 77° true, distant 42 miles.

Proceeding northward of Sapudi, a clump of tall trees on the north point of the island bearing 261° true will lead midway between Bulumanuk island and the Koset rock.

KANGEANG GROUP consists of one large island and several smaller ones, with numerous islets around and between them; together they occupy a space of 45 miles in a direction east-south-east.

General charts 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 2° 0' E.

Kangeang island is about 23 miles in length east and west, varying in breadth from 3 to 12 miles. Its north-west part is high and rugged, covered with trees, and visible 30 miles off. The eastern part is of the same height, but of a level appearance. The south-west part is not so high, but thickly wooded, and it may be seen about 21 miles off. The island is very fertile, and has a population of about 15,000.

The reef surrounding the island extends 4 or 5 miles off the north-east side, which is little known; it extends 2 miles off the west coast in places, and Kemirian, bearing 174° true, leads half a mile outside it.

Plan of Ketapang bay on 934.

Mamburit island (Lat. 6° 48' S., Long. 115° 15' E.), high, and visible 25 miles in clear weather, is separated from the north-west point of Kangeang by Bromo passage, nearly 3 cables wide, with 12 to 17 fathoms water. The island is on the east side of a reef of sand and scattered stones, which dries half a mile off, north, west, and south. A flat, with heads of less than 4 fathoms, stretches 2 miles south-westward, with a dry reef, named Batu Tajur, one mile 224° true from the island. The Dutch Sailing Directions state that, in 1889, a small one-fathom patch was found by the Government S.S. *Reiger*, with Tanjong Tinggi in line with the south-east extreme of Mamburit, and the middle of Kemirian in line with the west extreme of Kangeang. A conspicuous tree may be seen on the south-west point, and there is a village surrounded by cocoanut trees.

It is reported that reefs extend 3 miles north-west from the island, and a reef with 3 fathoms water lies 4 miles, 332° true, from it.

Ketapang bay, at the north-west end of Kangeang island, and southward of Mamburit island, is the principal anchorage of the group. The head of the bay is encumbered with detached reefs projecting nearly 1½ miles, and the shore reef on the south-east side dries out from a quarter to half a mile. The deep water, of from 7 to 12 fathoms, extends over a space 3 miles long, by about one mile wide.

The villages of Ketapang and Sangka are at the head of the bay; some refreshments may be had, but water is scarce and only obtainable from wells near the villages. The town of Ardjasa, and residence of the controller, is 3 miles eastward.

Beacons.—The outer edges of the reefs at the head of the bay, and on either side of the two inner anchorages, are marked by beacons; the outer ones are liable to be destroyed in strong westerly winds. On the west side of the southern Takat Patokanan reef is a leading beacon with white cone topmark.

Anchorage.—There is shelter in the north-west monsoon, in 8 fathoms, 2 cables south-east of Tanjong Batu Guluk, the north point

General charts 1654, 941b, 2759a.

Plan of Ketapang bay on 934. Var. 2° 10' E.

of the bay ; and during the south-east monsoon, in 4 fathoms water, in a small bight between the reefs in the centre of the bay and the bank drying off the south-eastern shore ; in the entrance of this bight there is a shallow spot of $3\frac{1}{2}$ fathoms.

Directions.—For the northern anchorage, enter with the eastern summit of Sumur Batu (*Lat. 6° 48' S., Long. 115° 17' E.*), covered with vegetation, at the head of the bay, in line with the leading beacon on the south Takat Patokanan reef 57° true, and steer for Batu Guluk when it bears 22° true. When the northern beacon of Takat Patokanan (the outer reef) bears 90° true proceed for the anchorage in 8 fathoms, hard clay, with Tanjong Batu Guluk 306° true, distant 2 cables.

The anchorage in the south-east corner of the bay is approached as above until Batu Guluk bears 22° true ; then a course 75° true, with a beacon on Takat Takat reef in line with the landing pier near Sangka village, will lead to anchorage in $3\frac{1}{2}$ to 4 fathoms, soft clay, about 2 cables westward of the beacon. It is advisable to go well into the bay, but great care is required to avoid the many coral heads.

When entering the bay, until the leading mark is recognised, Bromo passage must be well open before the east point of Kemirian island is in line with the west extreme of Kangeang.

Large sailing vessels, in the south-east monsoon, may anchor in about 10 fathoms, on the line of the leading mark with the east point of Mamburit island bearing 1° true.

Vessels should leave Ketapang bay on the line of the leading mark—the wooded summit in line with the leading beacon on Takat Patokanan 57° true—and round Tanjong Batu Tete in not less than 8 fathoms ; thence, if bound for the southern anchorages of the group, steer for the west end of Kemirian island, 174° true, until the north-west point of Panjang island bears 101° true.

Tides are similar to those of the east coast of Madura ; in July it is high water about XIh. a.m., and in December about XIIh. p.m. Springs rise 6 to 7 feet ; neaps 3 to 4 feet.

Chart 1654, Island of Java, eastern portion.

The south coast of Kangeang, and islands eastward, are but little known, and must be approached only under favourable conditions.

Hekla bay, on the south-west side of Kangeang, has anchorage in 6 fathoms in the south-east monsoon, but the bay is unsurveyed.

Gedeh bay, also unexamined, is about 5 miles eastward of Hekla bay ; all that is known of the place is that in 1805 a Dutch frigate and convoy anchored in 24 fathoms, mud. A dry bank is charted from one to $2\frac{1}{2}$ miles eastward of the south point of Kangeang.

General charts 1654, 941b, 2759a.

Plan of Saubi road on 934. Var. 2° 0' E.

Saubi road (Lat. 6° 56' S., Long. 115° 26' E.), on the south-east coast of Kangeang, affords good sheltered anchorage in either monsoon in 7 to 10 fathoms, muddy bottom, northward of the village on the north-west point of Saubi. The approach between Saubi and Sapa-pang islands is clear, and half a mile in width, but the shore on both sides is rocky, and should be passed at the distance of more than a cable. A detached rock, with 5 feet water, lies 3 cables 51° true from the north-west point of Saubi island, and at one mile eastward of the point, foul rocky ground extends half a mile into the road, otherwise there seem no hidden dangers.

Chart 1654, Island of Java, eastern portion.

Panjang island, the south-easternmost of the Kangeang group, is 9 miles in length east and west; it is surrounded by a reef which extends about a mile to the eastward, and the north side is foul, with detached reefs drying at low water, for fully 3 miles out. There is a large population, and considerable fishing trade. Sesail island stands on the reef off the north-west point of the island. The islands and reefs northward and north-westward to Kangeang, together with all the neighbouring waters, have been but slightly examined, and little is known beyond such features as are shown on the published charts.

Anchorage has been obtained northward of Sadaur (Saur); westward of Sesail; westward of Sepekang; between Sedulang besar and Sedulang kecil; south-eastward of Pangerungan kecil; and south-westward of Pangerungan besar.

Directions.—Approaching from Ketapang bay, with the north-west point of Panjang bearing 101° true, a course may be gradually steered into the centre of the channel between Sibus and Sesail islands when the north end of Sesail bears 78° true, and for the opening between Paliat island and Sepekang when the south side of the latter is 315° true; when the north point of Bangko islet is 259° true, steer 0° true for the anchorage in 7 fathoms, sand, with the south point of Sepekang bearing 90° true. The holding ground here is bad, and in the north-west monsoon, when squalls are violent, a second anchor should be in readiness.

The anchorage between Sedulang besar and Sedulang kecil is in 12 fathoms water, with the south point of Sedulang besar, 87° true, and the west point 27° true.

The above anchorages may also be approached from eastward by the channel southward of Pangerungan islets.

A reef has been reported one mile, 311° true, from the south-west point of Serijing Besar.

Tidal streams.—The flood stream runs north, and the ebb south.

General charts 1654, 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 2° 5' E.

Sakala or Hastings island (*Lat. 6° 57' S., Long. 116° 15' E.*), the easternmost of the Kangeang group, lies 21 miles 65° true from Panjang; it is 2 miles in length, low and wooded. The channel between this island and the Paternoster group is about 60 miles wide, and is the usual passage between the straits of Alas and Makassar.

Anak Kangeang or Kulkun islands, to the north-east of Kangeang, are very imperfectly known, and positions uncertain; they are four or five in number, and all low. Arahan, the northernmost, is placed in *lat. 6° 31' S., long. 115° 44' E.*; several dangerous coral rocks lie far to the eastward of these islets, and out of sight of land; and one rock is shown 10 miles 296° true of Kala Pajar, the north-westernmost islet, in *lat. 6° 31' S., long. 115° 28½' E.*

Looper reef, with 2½ fathoms over it, is shown 9 miles 101° true of Arahan.

Belliqueux reef, with 3 fathoms over it, on which H.M.S. *Bel-liqueux* struck, is placed in *lat. 6° 32' S., long. 116° 0' E.* The islands were not visible, but Hastings island was supposed to bear 164° true. Just before striking, the *Belliqueux* had 50 fathoms.

Two reefs, in approximately *lat. 6° 27' S., long. 116° 16' E.*, with a depth of 5 to 7 fathoms, and *lat. 6° 29' S., long. 116° 6' E.*, with a depth of 3 fathoms, were reported in 1910. They are marked by discoloured water.

Willem I. reef, covered by 3 fathoms water, was reported in 1883 to be situated in *lat. 6° 34' S., long. 116° 42' E.*, or about 35 miles 49° true of Sakala island.

Peterborough reef, discovered in 1871 by a vessel of that name, was placed in *lat. 6° 39' S., long. 115° 50' E.* It appeared to be a narrow coral reef, steep-to. From the reef Arahan was just visible bearing 325° true, distant 10 miles.

Cyclops reef, with 4½ fathoms over it, lies about 6 miles, 171° true, from Miongang, the southernmost Kulkun island. Suriname shoal, covered by 2 fathoms, is 4 miles, 125° true, from the same island.

Gusong Sedulang lies 13 miles northward of the Sedulang islands, and 9 miles, 101° true, from Cyclops reef.

Sumbing reef, with 3½ fathoms over it, is 5 miles from the north coast of Kangeang. A rock, not named, stated to be covered with 3 fathoms water, lies 4 miles, 333° true, from Mamburit.

Prince Maurits reef is shown on the chart in *lat. 6° 19' S., long. 115° 29' E.* A bank with 9 and 10 fathoms water over it, is placed 20 miles, 321° true, of Prince Maurits reef, and a bank with 4½ fathoms is shown 11 miles, 216° true, of Prince Maurits reef.

General charts 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 1° 50' E.

A rock, on which the S.S. *Pontianak* struck in 1913, lies 25 miles, 291° true, from Miongang.

CAUTION.—The area between Prince Maurits reef and the Kangeang group has not been examined, and should not be used for navigation.

Chart 941b, Eastern archipelago, western portion.

BAWEAN ISLAND is approximately 60 miles north of Surabaya strait. It is nearly circular in form, 11 miles in greater diameter, and rises about the centre to a height of 2,159 feet. The island is surrounded by dangerous reefs, especially off its eastern side where they extend to a distance of 9 miles from the coast with depths of 25 to 30 fathoms between them, rendering the approach on this side very dangerous. There is no harbour, but anchorage may be had in the following places, all rather exposed: Sankapura road on the south coast, Bangsal bay on the west coast, Promahan bay on the north coast, and near Tanjong Gebang on the north-east coast. The population numbers about 38,000.

The coast reef follows, approximately, the outline of the coast. From Tanjong Alang Alang, the south point of the island, to Tanjong China, the north-western point, it has an average width of 3 cables, and is steep to with 18 fathoms depth at a little over a cable's length from it. To the northward of Tanjong China the reef is wider, extending to $1\frac{1}{2}$ miles from the shore and inclosing the islet Bila. From here the reef closes the coast again to the east, and off Tanjongs Mantegi and Gebang it is narrow; it then opens out again and is from half a mile to a mile wide along the east coast.

Outlying islands and reefs.—**Nusa islet** (*Lat. 5° 44' S., Long. 112° 32' E.*) is a bare rock 62 feet high, lying 301° true, distant 3 miles from Tanjong China. A reef 2 cables wide surrounds it, and shoal patches lie around on all sides within a radius of 2 miles. Bila, a wooded islet 157 feet high, stands on the coast reef 80° true of Nusa; shoal patches of 4 or 5 fathoms lie $1\frac{1}{2}$ miles 339° true of Bila, and the space between the Bila and Nusa reefs has a coral floor with places of uneven depth in it, and should be avoided.

Karang Tangkat.—The outer part of this reef lies 2 miles, 294° true, from Nusa islet; it is three-quarters of a mile long, east and west, and covered by 3 fathoms least water. Between Nusa and Tangkat there are irregular soundings of 10 to 20 fathoms, but no other shoals were found.

Karang Luar is a very dangerous reef only a few feet below the surface about half a mile in length, and nearly a mile, 226° true, from Nusa islet. On the north-west side of the reef there was in 1889 the wreck of the steamship *Bengal*, under water. The space between Karang Luar and Nusa islet is filled with shoals.

General charts 941b, 2759a, 1263.

Chart 941b, Eastern archipelago, western portion. Var. 1° 50' E.

About the west side of Bawean and off the entrance of Bangsal bay there are several detached reefs covered with less than one fathom water. The outermost of these is one mile, 294° true, from the west point of Bawean.

Karang Jambang is small, and covered by 7 fathoms water, 2¾ miles, 294° true, from Tanjong Gaäng, the south-west point of Bawean.

Karangs Tangkat and Gua.—Tangkat is an extensive reef 1½ miles long west-north-west, with 2½ fathoms water over the middle, and 6 fathoms over the remainder, with 33 fathoms around. The centre of the reef bears 241° true, 4½ miles from Tanjong Alang Alang. Gua, one mile east of Tangkat, is half a mile in length east and west, and covered by 7 fathoms water, with 20 to 30 fathoms around. Both these reefs can generally be seen by the discolouration of the water over them. The channel between them and the coast is clear, with depths of 26 to 35 fathoms.

Karang Darah, about 2 cables in diameter, and covered by 8 fathoms water, is 170° true, 2¼ miles from Tanjong Layar.

Karang Tangkat Timor (*Lat. 5°55' S., Long. 112°43' E.*) is a coral patch 3 cables in diameter, covered by 6 fathoms water, 3¾ miles, 136° true, from Tanjong Layar.

Noko islet, three-quarters of a mile, 102° true, from Tanjong Layar, is low, covered by brushwood, and fringed by a sandy beach; it is surrounded by a reef from 2 to 3 cables wide. A detached patch of 4 fathoms lies, 226° true, 4 cables from the reef.

Karang Cheët.—A chain of reefs covered by one to 5 fathoms extends eastward of Noko islet, and beyond these, at a distance of 3 miles 80° true of Noko islet, lies Karang Cheët, which dries in parts at low water, and is nearly a mile in length east-north-east. A patch of 5 fathoms is 186° true from the east end of Karang Cheët reef.

Karang Bungarang lies 4½ miles, 80° true, from Noko islet. It extends 1½ miles south-east, and is three-quarters of a mile wide, and partly dries at low water. Between the reefs of Bungarang and Gili the bottom generally is foul, with several patches covered by very little water, and soundings of 6 to 9 fathoms between them.

Karang Bitian, 4½ miles east of Karang Bungarang, is a narrow reef a mile long north and south, with 3½ fathoms on the southern extremity, 4 to 7 fathoms over the remainder, and 20 to 25 fathoms around. This is the easternmost known danger off Bawean.

Gili, 1½ miles, 80° true, from the east point of Bawean, is three-quarters of a mile long north and south, and thickly wooded. The northern extremity rises to a height of 345 feet. Gili Noko is a low sandy islet south of Gili. These islets stand on a reef which extends

Chart 941b, Eastern archipelago, western portion. Var. 1° 50' E.
 2½ miles north and south; and 2 miles east and west, with 12 fathoms close-to. Gili Manukan is a small wooded rock near the south-east point of Gili.

Karang Berapat, 3½ miles, 102° true, from Gili Manukan islet, is three-quarters of a mile long, north and south, and partly dries at low water. Between the reefs of Gili, Berapat, and Bungarang, the bottom is generally foul.

Karang Tambaga, 2 miles 57° true from Gili islet, is one mile long north and south. The west side dries at low water, and is steep-to, with 17 fathoms near. A patch of 5 fathoms lies 3 cables to the southward.

Karang Barat, 2½ miles, 29° true, from Gili islet, is three-quarters of a mile long, north-west and south-east, and covered by a least depth of 3 fathoms.

Karang Gosong, 4½ miles, 68° true, from Gili islet, is 1½ miles long north-west and south-east, and half a mile wide. Over the centre of this reef there is a white sandy cay visible 4 miles, and over the whole extent of the reef there are patches which dry at low water. On the north-east side of the reef there was in 1889 the wreck of the steamship *Baron Bentinck*. Van Vurden (Woerden) reef, covered by 1½ fathoms, lies 1½ miles north of Gosong.

North coast.—A patch of 2½ fathoms lies at the entrance of Promahan bay, 1½ miles, 248° true, from Tanjong Mantegi (*Lat. 5° 43' S., Long. 112° 41' E.*); and Batu Kebo, a group of rocks above water, lies 4 cables 80° true from the same point.

Plan of Sankapura bay on 932.

SANKAPURA BAY is situated on the south coast, between Tanjongs Alang Alang and Laya. Tanjong Alang Alang is the end of a peninsula about half a mile long, with a hill on the middle 230 feet high, which, when seen at a distance of 5 miles, appears like an islet. The coast reef extends 3 cables off the point, and has some large rocks on it; the reef continues along the coast to the northward and eastward, at a distance varying from half a mile to a quarter of a mile, with 3 fathoms near its edge and several detached reefs off it.

Dangers.—**Kebo**, 8 cables, 51° true, from Tanjong Alang Alang, and 3 cables from shore, is a large rock above water surrounded by a reef which nearly joins to the shore reef.

Karang Timbul, covered by 1½ fathoms water, lies half a mile, 80° true, from Kebo. Kuchul Kechil and Kuchul Besar are two rocks lying 102° true, 4 cables, and 114° true, 3½ cables, from Kebo. On the former the depth is 4 fathoms, and on the latter 5 fathoms.

General charts 941b, 2759a, 1263.

Plan of Sankapura bay on 932. Var. 1° 50' E.

To describe in detail all the reefs in the roadstead would be perplexing to the mariner; they all lie north of a line drawn from Noko islet through Tanjong Layar; many of them are marked by beacons, and one by a red conical buoy surmounted by a ball.

Tanjong Layar (*Lat. 5° 52' S., Long. 112° 41' E.*) is a peninsula connected with the main island by a low ridge of sand which covers at very high tides; the outermost point is 600 feet high, and covered with dark trees.

Anchorage.—There is a tolerable anchorage in 12 to 14 fathoms, mud and sand, with the highest part of Tanjong Layar bearing 91° true, and the flagstaff 1° to 23° true; but with strong winds either from west or east a heavy sea sets in. Small vessels can find sheltered anchorage during the north-west monsoon in the inner anchorage in 4 to 7 fathoms, with the flagstaff bearing 80° true. To enter the inner harbour Mount Sumber, a sugar-loaf hill, 1,800 feet high, should be brought to bear 358° true, and steered for on that bearing, passing to the east of Karang Timbul, and west of two reefs marked with white triangular beacons.

Pier.—A stone pier extends from near the flagstaff to the edge of the 3-fathoms line.

Tides.—Generally there is only one tide observable in 24 hours, but at the equinoxes there are traces of a second tide. On 21st June it is high water at IXh. 42m. a.m., and on 21st December at IXh. 42m. p.m., being 2 hours earlier each following month. Springs rise 5½ feet.

Chart 941b, Eastern archipelago, western portion.

Tidal streams.—Generally speaking, the flood stream sets to the east, and the ebb to the west, but the tidal stream is frequently lost in the stronger current that sets in with the wind according to the prevailing monsoon. Off the north and south points of the island there are frequently eddies and counter currents, and during the south-east monsoon there is usually a tide-race west of Nusa islet.

Bangsai bay, on the west side, has fair anchorage in 15 fathoms, sand, just off the shore reef, sheltered from south-east winds. To reach this anchorage a vessel should bring the western extreme of Tanjong China to bear 63° true, and steer for it on that bearing until Nusa islet bears 0° true, when she can steer in 114° true for the anchorage, passing Karang Jambang at a distance of 1½ cables.

Promahan bay.—In approaching this anchorage it is necessary to be cautious to avoid the 2½-fathoms reef which lies 1½ miles, 80° true, from Tanjong Mantegi. When the south-east monsoon is

General charts 941b, 2759a, 1263.

Chart 941b, Eastern archipelago, western portion. Var. 1° 50' E.

strong an inconvenient sea sets in round Tanjong Mantegi. The Dutch chart shows 7 fathoms at the mouth of the bay. Within the bay there is a detached coral patch covered by 3 feet water.

Kepah Tenga.—There is anchorage off the village of this name on the north-east coast, with Tanjong Gebang bearing 327° true, and the east point of Bawean about 180° true, in 12 fathoms, mud.

Le Bœuf rock (*Lat. 5° 13' S., Long. 113° 17' E.*), discovered by the master of the *Annie Florence* in 1879, was examined by the Dutch surveyors in 1889. It is about 44 yards in extent, with an estimated depth of one fathom on it. The sea breaks heavily over it. At about half a cable's length from the reef the depth is 18 fathoms, stones, and at a distance of 3½ cables soundings of 26 and 28 fathoms over sand were obtained. In clear weather Mount Besar in Bawean island may be seen from near the reef, bearing 227° true, distant 52 miles. A patch of 9¾ fathoms, gravel and sand, lies 68° true, 9 miles off Le Bœuf rock.

Arrogant shoal, position doubtful, was discovered by H.M.S. *Arrogant* on 23rd January, 1802, and reported to be about a quarter of a mile long and a cable wide, with a depth over it of less than 6 feet, and 25 fathoms within a cable's length, and was placed in *lat. 5° 11' S., long. 112° 58' E.*, but is charted in a slightly different position. This rock was searched for in 1889 by the Dutch surveyors without success.

SOLOMBO ISLANDS.—**Great Solombo** (Masalembo Besar) (*Lat. 5° 34' S., Long. 114° 26' E.*) is 5 miles long north-west and south-east, 3 miles broad, and surrounded by a reef which extends one to 2 miles from the shore. The island is thickly wooded and of a general height of 130 feet, with a hill near the southern part of 682 feet; from southward this hill appears as a peak. Some water may be obtained on the south-west side. There is a rock 3 miles off the south-west point. View at page 184.

Little Solombo (Masalembo Kechil), 259 feet high, 5 miles north of Great Solombo, is flat-topped, thickly wooded, and surrounded by a reef which extends one mile from the shore. The channel between the reefs of Great and Little Solombo is 2¾ miles wide.

The sandbank north-westward of Little Solombo does not cover.

Arends islands will be described in Chapter X.

General charts 2759a, 1263.



Little Solombo.

Great Solombo, bearing 48° true, about 10 m.

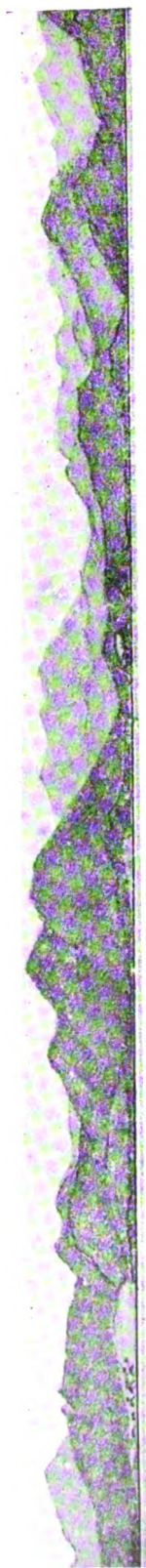
Solombo islands.

Mt. Halimun.



(a)

Ujong Karang Papak.



(b)

Pelabuan Ratu.

Mt. Gedeon.



(c)

*Tanjung Kenbang,
bearing 168° true 2,150 m.*

Java, south coast; Wynkoops bay.

CHAPTER VII.

SOUTH COAST OF JAVA FROM SUNDA STRAIT TO BALI STRAIT.

VARIATION IN 1914.—Decreasing three minutes annually to stationary.

Charts 1653, 1654, Island of Java.

GENERAL APPEARANCE.—Unlike the north coast of Java, which in most places presents a low front to the sea, with regular soundings, and anchoring ground almost everywhere, the south coast of the island is generally high, consisting of steep rocks and rugged points, covered always with foam and breakers, and the whole shore wearing a barren and desolate appearance. In general, great depths will be found in the immediate vicinity of the coast, and although in some places a less forbidding beach and a decreased depth of water may be found, yet they very seldom afford a fit spot for anchoring, by reason of a heavy swell which breaks unceasingly on all exposed points, or rolls into the bays and havens. Notwithstanding this, the south coast of Java is not altogether destitute of places of refuge, for there are certain bays and harbours which afford shelter in either monsoon.

From the small extent of Java in latitude, and the consequent nearness of its north and south coasts, the mountains serve as landmarks equally on either side of the island. Throughout the north-west monsoon some of these mountains may be discerned at a distance of 45 to 75 miles, but in the south-east monsoon they are generally concealed by a hazy atmosphere, and therefore not distinguishable till very near.

Winds and weather.—Prevailing winds on the south coast of Java are southerly, and it is only in January that they blow, with any degree of steadiness, out of the northern hemisphere. The south-east monsoon commences in April and lasts until September, blowing between east and south, but occasionally from south-south-west or south-west.

In October the mean direction of the wind will be south, in November and December south-south-west, and in January west-north-west, and north-west. A retrograde motion begins in February, and in March south-west winds are general, occasionally shifting to north-

General charts 941a, 941b.

Charts 1653, 1654, Island of Java. Var. 0° 10' E.

west and south-east; this unsettled condition lasting until the latter half of April.

Rain in the east monsoon may be expected about 8 days in a hundred: during the west monsoon, especially in the first three months of the year, this percentage will increase to about 25. Very near the coast, however, great differences will be observed, a considerable fall may occur where high spurs from the mountains extend to the shore, while on level land little is felt.

With so large a proportion of winds from southward the sea is frequently turbulent, and a heavy swell generally beats upon the coast.

The current runs usually to the south-east, being strongest during the north-west monsoon, and weak at other times.

Chart 2056, Sunda strait.

COAST.—Java head, Tanjong Sangian Sira, Kelapa, and Trowers islands are described in Chapter III.

From Tanjong Sangian Sira (*Lat. 6° 50' S., Long. 105° 14' E.*) the coast trends about 96° true for 68 miles to Tanjong Payung at the entrance to Wynkoops bay; a sandy beach lines the shore, and a heavy sea breaks at all times. Here and there a native village may be seen, but this part is scantily inhabited. Between Java and the off-lying islands of Deli and Trowers is a bank of soundings with 15 to 30 fathoms, coarse sand and mud. *See also pages 31, 32.*

Tanjong Karang Papajan, 2 miles east of Tanjong Sangian Sira, is high, steep, bare land; one mile east of the point is a group of rocks partly above water. The high rocky ground continues north-eastward 2½ miles to a small rivulet, thence a low sandy shore bends eastwards 8 miles to Tanjong Tereling, which is low, sandy, and surrounded by rocks. Tanjongs Pangorok and Sodong are 4 and 8 miles eastward of Tanjong Tereling, both somewhat conspicuous, with off-lying rocks, and hilly land behind. Between Tanjongs Tereling and Pangorok is the low swampy neck at the head of Welkomst bay.

From Tanjong Sodong to Tanjong Panto, a distance of 21 miles, is a gently sloping shore, level and wooded, with sandhills and many small streams. There is a bank of 3 fathoms water, 1½ miles 113° true from Tanjong Sodong, and eastward of Tanjong Mentayung shallow water projects 2 miles.

Tanjong Panto is fringed with rocks, and the sea may break a mile off. Chi Binuangan, the largest stream on this shore, empties on the west side of the neck within the point, with the village of Binuangan at the mouth; in fine weather small craft enter, and find shelter within.

General charts 1653, 941a.

Plan of Wynkoops bay on 3030. Var. 0° 20' E.

WYNKOOPS BAY (Pelabuan (Palabuan) Ratu bay) is $9\frac{1}{2}$ miles wide between Tanjongs Payung and Karang Bentang, and penetrates 10 miles to the north-east, being thus quite open to west and south-west winds. The bay is surrounded by high hills clothed with trees to the water's edge; in some places rugged points project, with a few scattered rocks reaching a cable off-shore. Several streams enter the bay, but the only one of importance is Chi Mandiri, of considerable breadth, but the bar at its mouth, on which there are heavy breakers, greatly impedes navigation. (Views at page 184.)

The Government storehouses for coffee and salt are at the head of the bay; some rocks covered by $1\frac{1}{2}$ and 3 fathoms water lie west of the stores, and so fend off the sea that boats can always land there. If it be necessary to land on the south side of the bay in the south-east monsoon, smooth water may be found in some places where native huts are seen near the beach, or behind rocks. On the north-west side of the bay there is no landing at that season.

Buoy.—There is a white conical buoy on the south side of the rocks off Pelabuan Ratu.

Anchorage.—The centre of the bay is deep, there being over 100 fathoms, but there is anchorage, in 8 to 12 fathoms, on the east side between Pelabuan Ratu (*Lat. 6° 59' S., Long. 106° 33' E.*) and Tanjong Kembang; and on the north side from Tanjong Karang Pamulang to Chi Bareno. A convenient berth, in 8 fathoms, stiff clay and sand, is with the flagstaff at Pelabuan Ratu 51° true, distant $2\frac{1}{4}$ miles. In the north-west monsoon it is better to anchor in a greater depth as the roadstead is then not so safe, the wind raising a considerable sea.

At night the north-east side of the bay is usually obscured by mists, and as the depth in the entrance is too great for anchoring, all vessels should stand off and on till the morning.

Tides.—It is high water at full and change at Vh. Springs rise 6 feet; neaps, $4\frac{1}{2}$ feet.

With heavy rains the stream from Chi Mandiri sets south-west along the coast, but it is never stronger than three-quarters of a mile per hour. There is sometimes also an outset from Chi Bareno of 2 miles an hour; but that part of the bay, the north-western, should never be visited without necessity, for although the ground is good enough when close in, there is much danger from the breakers.

Winds.—At full and change of moon there is commonly a change of weather; baffling and variable winds with sudden squalls prevail, and the sea runs higher than at other times. The land breeze during the night blows from either north-east or south-east according to the

General charts 1653, 941a.

Plan of Wynkoops bay on 3030. Var. 0° 20' E.

side of the bay; the sea breeze usually sets in at 9 or 10 o'clock in the morning, and during the south-east monsoon is moderate in force. The south-east monsoon does not blow strong in the bay, probably owing to the surrounding high mountains, though during the opposite season the western wind blows with force. Wynkoops bay is visited during both seasons by coasting vessels as well as by large ships. The climate generally is healthy.

Supplies.—Beef, fowls, rice, and fresh water are procurable. Ships coming from Europe in the south-east monsoon often first make the land near Tanjong Genteng or near Wynkoops bay; should a vessel in such case require fresh water, it may speedily be procured in the bay.

Plan of Zand bay on 932.

ZAND BAY (Chiletu bay), to the south-west of Wynkoops bay, is $3\frac{1}{2}$ miles wide between Tanjongs Karang Ragak and Karang Chapio (*Lat. 7° 11' S., Long. 106° 23' E.*), but further in, between Tanjongs Karang Ragak and Kunti, contracts to a width of $1\frac{3}{4}$ miles. The depths at the entrance are irregular, from 30 to 50 fathoms, but just outside, in a line between Tanjongs Bentang and Karang Chapio, and bearing 311° true from Pulo Rametuk, there is a patch of 7 to 14 fathoms. A little within the entrance the depth decreases rapidly to 30, 20, and 10 fathoms, and the head of the bay, to the eastward of Tanjong Kunti, 2 miles east of Tanjong Karang Chapio, is very shallow. View on plan.

On the north-east and south-west sides of the bay the mountains reach nearly to the sea, but the south-east shore is less abrupt, and high and marshy alternately. The hills and the lowland are all covered with tall trees, while bamboos grow freely near the beach. The bay is essentially rocky, yet in the middle there is a large and good anchoring ground consisting of mud mixed with sand. Along the north-east side of the bay the rocks do not run off more than a cable's length except at Tanjong Karang Ragak where a reef, visible above water, projects for a distance of 3 cables to the south-west. Along the south-west side of the bay, and upon Pulo Rametuk there is no great surf with the ebb tide, and with the flood the breakers just serve to make the rocks visible, but on the north-east side of the bay the breakers are usually so high that boats cannot land there.

Pulo Rametuk and Pulo Manuk.—On the south side of the bay lie the islands Rametuk, a clifly island with trees on it, Manuk, a rocky islet lower than Rametuk, and several detached rocks, separated by depths of one fathom.

General charts 1653, 941a.

Plan of Zand bay on 932. Var. 0° 20' E.

Rivers.—Chi Letu runs into the sea 126° true of Pulo Rametuk, and is navigable for boats at half tide for a distance of 2 or 3 miles; the salt water runs up for 2 miles. Chi Kanter and Chi Taringul, which enter the eastern side of the bay, are barred by breakers across their mouths and not navigable. In these rivers there are waterfalls 400 and 200 feet in height; the one in Chi Kanter is conspicuous from the entrance of the bay.

Rocks.—There are many rocks, some visible and some sunken, on the south side of the bay and around Pulo Rametuk; the outermost, Castor rock, is particularly dangerous, being surrounded by depths of over 11 fathoms, and lying near the anchorage; its top is only 8 feet in diameter and covered by 2 feet at low water. Another rock of 2½ fathoms lies 43 yards, 136° true, of Castor rock. From Castor rock (*Lat. 7° 10' S., Long. 106° 26' E.*) the north extremity of Pulo Rametuk bears 121° true, distant 9 cables. Two sunken rocks lie about 2 cables north and north-east, respectively, of Tanjong Kunti.

Buoy.—Castor rock is marked by a white conical buoy moored on its north-eastern side.

Anchorage.—The best anchorage for a large ship is about the middle of the bay in 12 fathoms, with the north extremity of Pulo Rametuk bearing 147° true, and Tanjong Karang Bentang, 26° true, or about half a point open of the land. Here a ship will be 4½ cables, 51° true, from Castor rock, and to avoid that danger when entering the bay it is advisable not to bring the north point of Pulo Rametuk to the eastward of 147° true.

Tides.—It is high water in Zand bay at full and change, at Vh.; springs rise 4¾ feet.

COAST.—Southward of Zand bay, between Tanjongs Karang Chapio and Chikepuh (Sodong Parat) about 3 miles southward, there are two bights, containing good anchoring ground, mostly white sand and shells mixed with clay. On account of the numerous rocks along this part of the coast these bights are avoided by strangers, but in the south-east monsoon they are convenient to anchor in for the night for vessels bound to Wynkoops bay and unable to reach that road before night-fall. A ship will be well sheltered here even with south-westerly winds, but during the north-west monsoon it would be very dangerous to anchor in either of them.

The northernmost of these two bights, a mile southward of Tanjong Karang Chapio, is about a mile wide, with depths of 28 fathoms at the entrance, shoaling rapidly within to 6 fathoms.

General charts 1653, 941a.

Chart 1653, Island of Java, western portion. Var. 0° 20' E.

Besides the rocks visible above water near the shore, a rock partly above water, named Karang Antu, lies half a mile west of the south point of the bight, and to avoid rocks under water, should not be approached within half a mile on its south and south-west sides.

The southern bight is also a mile wide at the entrance, with depths of 20 to 40 fathoms, shoaling within to 9 fathoms. Besides Karang Antu, to the northward of the entrance, there are no dangers, as the reefs which project but little off-shore, and Batu Kuok, in the middle of the bay, are all visible above water. The anchorage is near the south side, where a small river runs into the sea, and affords fresh water in most seasons.

Wood for fuel, plenty of fish, and turtle in abundance, are found in both bights.

In proceeding southward towards Tanjong Genteng, the swell becomes greater and the surf higher; and although the lead marks from 10 to 40 fathoms between 4 and 8 miles off-shore, the coast to the southward of Tanjong Chikepuh affords no safe anchorages. Upon the rocks off Tanjong Genteng the sea breaks with tremendous force, preventing all intercourse with the shore; and in the south-east monsoon, abreast this cape, the wind increases considerably in strength.

Tanjong Genteng (*Lat. 7° 23' S., Long. 106° 24' E.*) is low, but nevertheless easily distinguished, and from the westward is very conspicuous. Near the point there is a low sandy island, with some trees on it. To the eastward of the point the coast bends round to Tanjong Gajah, and has somewhat the appearance of a wall with embrasures. About 3 miles off-shore the depth is 19 fathoms.

Bolong reef is shown on the Dutch chart to extend along the coast to the eastward for a distance of 10 miles from Tanjong Genteng.

Plan of Chi Lauteureun bay on 3030.

Chi Lauteureun bay.—From Tanjong Genteng the coast stretches 102° true for a distance of 80 miles, without any noticeable point as far as Tanjong Bojong Kerencheng; throughout this whole stretch the coast is high and mountainous. Chi Lauteureun bay, to the northward of Tanjong Bojong Kerencheng, is open to the west and south, but under favourable conditions of wind and sea there is anchorage in 6 to 7 fathoms, with Tanjong Bojong Kerencheng 170° true, distant 4 cables. The point is covered with high trees, a coral reef projects north-westward 2 cables, and a shoal spit, with from 3 to 5 fathoms, 9 cables. The landing place is at some huts on the north side of the river, in the south-east corner of the bay.

General charts 1653, 941a.

Plan of Chi Lauteureun bay on 3030. Var. 0° 40' E.

Coasting along this part of Java a ship may often correct her reckoning by bearings of the summits of the mountains.

Chart 1653, Island of Java, western portion.

Coast.—From Tanjong Bojong Kerencheng the coast trends eastward for 50 miles, to Tanjong Madasari, with only one notable point, Tanjong Gedeh; in this stretch the coast is low near the sea, well wooded, and cultivated; it seems to be free from dangers, although off most of the points there are reefs on which the sea usually breaks with violence, and in every bight or curve a heavy surf rolls up the white sandy beach. In general, at 4 miles distance off-shore, 50 to 30 fathoms will be found; and within that distance 30 to 12 fathoms, mostly sandy bottom, and tolerably good holding ground were it not for the very high swell.

Penanjung bay, east of Tanjong Madasari, is about 18 miles wide, and is divided by Tanjong Simangu (*Lat. 7° 44' S., Long. 108° 40' E.*) into two bays—Dirk de Vries to the westward, and Maurits to the eastward. Dirk de Vries bay affords good shelter during the north-west monsoon, and anchorage in 10 fathoms, with Tanjong Madasari bearing 199° true, and Tanjong Simangu 91° true; and in the east monsoon, on the east side of the bay off the isthmus inside Tanjong Simangu, in 8 fathoms. Refreshments may be procured, but water only with great difficulty.

In Maurits bay, during the west monsoon, shelter may be found under Simangu peninsula, in 8 to 10 fathoms, with the south-west point of the bay 186° true, and Tanjong Besek 105° true. There are no dangers, and the soundings decrease regularly to within a mile of the shore. Buffaloes, rice, fruit, vegetables, and water are procurable.

Nusa Kambangan is separated from Java by a very narrow channel, forming on either side of it the bays of Penanjung and Schildpadden. It is about 15 miles long, 4 miles wide, rises to a height of 660 feet, and is covered with large trees. Chitando inlet is at the western end of the island, and at the eastern end, Chilachap inlet. This latter is a place of considerable resort for vessels of all sizes. Northward of Nusa Kambangan the channel expands into a lagoon called Segara Anakan, which occupies a space of fully 4 miles square, but is so filled by extensive mudbanks that it is only navigable by praus and small vessels.

Tanjong Besek is the south-west point of Nusa Kambangan. Ambur rock, a dangerous sunken rock, bears 344° true, distant $3\frac{1}{2}$ cables from Tanjong Besek. Bator bay, north of Tanjong Besek, though only half a mile wide, affords good shelter in easterly winds; it has a sandy bottom, and is 7 to 8 fathoms deep at the entrance, and 5 fathoms deep at a cable's length off-shore.

General chart 941a.

Plans of Chitando and Chilachap inlets on 932. Var. 0° 50' E.

CHITANDO INLET, the western entrance to Segara Anakan, is 2 miles long and about 2 cables wide, and both sides are high, steep and rocky. Wré island divides the passage into two, called respectively Tando and Sehel channels; there are also some detached rocks which make it more intricate.

The opening into this inlet is not easily discerned from the southward on account of its tortuous course and high shores; but by steering a little to the north of Tanjong Besek, the island Wré will be distinguished when standing in-shore.

Wré island (*Lat. 7° 42' S., Long. 108° 47' E.*) is high, rocky, and densely wooded; it is nearly a mile in length north-north-east, and varies in breadth from 440 to 55 yards. It is difficult to prescribe under what circumstances the channel on either side of Wré island should be preferred; the position of the vessel, the wind and weather, the tide, and other considerations must decide the choice of the prudent seaman.

Sehel channel, to the west of Wré island, is not so dangerous as Tando channel, but the depth throughout its whole length is irregular from 4 to 16 fathoms, bottom gravel and broken rocks. It is necessary, when north of Wré island, to keep in mid-channel, as a shoal with less than 3 fathoms over it extends 2 cables north of Wré island; and to the westward of Siragalo peninsula, Rawit rocks, which dry at low water, project half a cable from the shore.

This channel is longer than Tando channel, and has the further disadvantage that when the wind is not favourable vessels cannot reach directly round Siragalo peninsula, and they are compelled to anchor, which occasions loss of time. In such circumstances, it is better to wait to the south-west of the north end of Wré island, because the north and east sides of that island afford less shelter, and a swell makes the eastern anchorage very inconvenient.

Siragalo peninsula is high and steep, and may be passed on the south-eastern and eastern sides at half a cable's distance in 6 and 12 fathoms water; but the Kambangan side should not be approached too near, as Gomboyok rocks, 80° true from the point of Siragalo, dry at very low tides. The eddy of the ebb tide along the Kambangan shore sets right upon those rocks.

Tando channel.—The reef projecting from Tanjong Sarang, the western extremity of Nusa Kambangan, is not so dangerous as its heavy breakers would indicate at the first appearance, for outside of this reef there is a hard sand bottom in 10 fathoms water, where, although much exposed to the swell, anchoring is not dangerous. In bad weather this reef should never be approached, except to pass it with

General charts 1653, 941a.

Plans of Chitando and Chilachap inlets on 932. Var. 0° 50' E.

a leading wind and good way. There is a detached $2\frac{3}{4}$ -fathoms patch half a cable northward of Tanjong Sarang. Within Tanjong Sarang lies the islet Manok, and 294° true from this islet the dangerous Tongak rock, which is, however, visible at low water. The channel is between Manok islet and Tongak rock, and is only $1\frac{1}{2}$ cables wide, with from 5 to 18 fathoms depth in the middle. Between Tongak rock and Wré island the passage is barred by rocks, and to the eastward of Manok islet there is only from one to 3 fathoms depth. Accordingly vessels should steer between Tongak rock and the reef off Tanjong Sarang for the west side of Manok islet, thence with course 45° true in 12 to 20 fathoms depth round Siragalo peninsula, and pass Tanjong Mati with a 349° true course.

As both these channels are too intricate for strangers they should not, except in case of necessity, take them without a pilot.

Anchorage.—There is anchorage off Tanjong Mati (*Lat.* $7^\circ 41' S.$, *Long.* $108^\circ 48' E.$), in 12 to 20 fathoms water, but a better berth may be found in 7 to 10 fathoms, sandy bottom, about 4 cables from the mouth of Chi Tando. There being extensive reefs on the Java shore and in the Segara Anakan, and the tidal streams and eddies very irregular, it is advisable to moor. There is a bar across the mouth of the Chi Tando which dries in places, but leaves a channel of 3 to 6 feet depth at low water; vessels load and discharge their cargoes by means of praus fitted for the purpose, which can reach the storehouses at Kali Putiang on the right bank of the river.

Tides.—It is high water, full and change, at VIh. 30m., but there is some irregularity. The rise and fall of the water depend much upon the winds, and on the greater or less discharge of the rivers which fall into Segara Anakan; spring tides generally rise 5 feet, and neap tides $3\frac{1}{2}$ feet.

Tidal streams.—The streams are variable in force and duration, except when the rivers are low, the flood and ebb then changing every 6 hours; but when the rivers are full the flood runs three, and the ebb stream nine hours.

Directions for Chitando inlet.—Sailing vessels in the south-east monsoon should make the land a little to windward of the western end of Nusa Kambangan, and then run along towards Wré island, taking care to avoid Ambur rock. In the north-west monsoon a ship should first steer for Tanjong Madasari and then into the entrance of the inlet.

The steep sides of Tando channel intercept all winds which do not blow straight through, and the little room it affords for working, along with its winding form, in most cases render towing or warping unavoid-

General charts 1653, 941a

Plans of Chitando and Chilachap inlets on 932. Var. 0° 50' E.

able. A ship must trust chiefly to the tidal streams, and should anchor at the mouth of the channel and wait for the flood. With westerly and southerly winds vessels must expect a heavy swell there, and although the holding ground is good it cannot be said to be a place of safety.

With southerly winds, in either monsoon, the entrance of this channel is very troublesome, and sometimes impossible; but with easterly winds and no high sea, a ship may anchor near the south side of Wré island, or in Bator bay on the west coast of Nusa Kambangan, and wait for a favourable stream.

The bottom is uneven in the passage, and consists of gravel and broken rocks; better ground will not be found until Segara Anakan is reached, and then only a small space. When abreast of Tanjong Mati a vessel will be landlocked on all sides, and being no longer exposed to the swell may anchor in safety, but as these channels are passed entirely by warping or towing it will be necessary to bring up frequently.

CHILACHAP INLET (*Lat. 7° 44' S., Long. 109° 1' E.*), opposite the eastern end of Nusa Kambangan, is an open port, and the most considerable on the south coast of Java. The importance of the place lies not so much in its trade, although being the outlet for the fertile central districts, this is not inconsiderable, as in the fact of its being, with the exception of Segoro Wedi bay, the only safe harbour on the whole south coast of Java during the south-east monsoon, and one capable of affording shelter at all seasons of the year to a goodly number of light-draught vessels.

The entrance to the harbour is $1\frac{1}{2}$ miles wide between South point on the north-west, and Karang Bolong to the south-east, but the greater part of this space is filled by a bank of hard sand extending more than a mile from South point towards Karang Bolong, leaving only a narrow channel $4\frac{1}{2}$ to 8 fathoms deep passing close along the Kambangan shore. This bank has very little water over it, and from it the depth of water increases very gradually to the north-east, being only 3 fathoms at the distance of one mile.

Karang Bolong.—The eastern part of Nusa Kambangan is high and terminates in the bluff head of Bolong; close off its north-east point lies Karang Bolong, a small rock with a single tree on it, and water-worn underneath.

LIGHT.—From a white stone tower, with a red lantern, 106 feet high on Chimiring hill, over the south-east point of Nusa Kambangan, about $1\frac{1}{2}$ miles southward of Karang Bolong, a *white flashing* light is shown, 655 feet above the sea. The light shows a flash of *eight seconds* duration *every minute*. The flash should be seen in clear

General charts 1653, 941a.

Plans of Chitando and Chilachap inlets on 932. Var. $0^{\circ} 50'$ E.

weather 33 miles, but the eclipse is not total within 30 miles. There is a signal station at the lighthouse.

Beacons.—Three pairs of stone beacons have been placed on the south shore of the entrance to Chilachap, as leading marks for the channel. Further in, two pairs of wooden screens mark the navigable channel from Karang Tenga to the inner anchorage. Besides the above, a pair of beacons show the fairway up the Chi Donan. In using these marks great caution is necessary.

A beacon with black truncated cone is placed in 11 feet water $2\frac{1}{2}$ cables westward of Karang Bolong (*Lat. $7^{\circ}45'$ S., Long. $109^{\circ}2'$ E.*), and marks the southern side of the entrance. The edge of the hard sandbank on the north side of the entrance is marked by a beacon with white hexagonal topmark, placed on the line of the beacons for vessels of deep draught, and two beacons with white balls, the western of these being on the line of the great beacons.

Entrance beacons.—(1) The principal pair are two stone towers surmounted with iron plates 25 feet in diameter, standing near Karang Tenga and leading up to Karang Rempak; they are 288 feet apart and appear in one line, bearing 247° true. (2) Two similar but smaller beacons near Banju Njapa, lead through the narrows of Karang Rempah; these are 75 feet apart and in one bear 223° true. (3) To the southward of Karang Rempak there are two similar beacons leading between Karang Rempak and Karang Tenga; these last are 45 feet apart and in one line bear 90° true.

These three pairs of beacons are alike in form, but the first pair are larger than the other two. The higher and inner beacons of each pair are white with three perpendicular black stripes. The outer and lower beacons are plain white. When a vessel is exactly in the fairway the white beacon covers the lower portion of the inner beacon, the black stripes on which are thus exactly over it (*see Fig. 1*). When, on the other hand, the two beacons appear near one another, so that the white beacon covers only one of the stripes of the inner beacon, as in Fig. 2, the vessel is as far out of the course as is consistent with safe navigation.

FIG. 1.

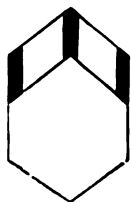
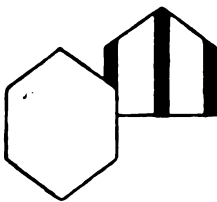


FIG. 2.



Two beacons for vessels of deep draught are placed on the hard sand-

General charts 1653, 941a.

Plans of Chitando and Chilachap inlets on 932. Var. $0^{\circ} 50' E$.

bank on the north side of the entrance; they stand 88 yards apart, and in line, on the bearing 262° true, lead northward of the reef extending from Karang Bolong, in 22 feet water. The front beacon has a white hexagonal board as topmark, the rear beacon a white hexagonal board with a black vertical stripe.

The screens are placed near Bali, south-westward of Karang Rempak, and indicate the limits of the channel from the southern end of the hard sand-spit up to the anchorage off Chilachap, in the following manner:—

The eastern pair of screens indicate the northern limit of the channel; they stand 65 yards apart and are in line, bearing 125° true. Their form is that of right-angled triangles, the longest sides, 25 feet long, being upright, with the right angle of the outer screen pointing to the north, and that of the inner screen to the south, so that when the long sides are seen touching each other a square is formed, and the alignment in this position, bearing as above, just clears the edge of the hard sandbank.

The western pair of screens indicate the southern limit of the channel; they stand 88 yards apart and are in line, bearing 119° true. Their form and size is similar to the last, but the right angle of the outer screen points to the south, and that of the inner screen to the north.

These two pairs of screens serve conjointly as marks up to the roadstead. The outer screens are white, the inner are white with a horizontal black stripe. When a vessel is in the middle of the channel the two striped screens are seen between the two white ones, as in Fig. 3. The screens should never be brought to mask one another. Fig. 4 shows them as they would appear to a vessel that has approached the southern limit of the channel.

FIG. 3.

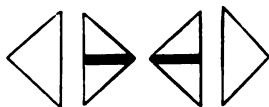
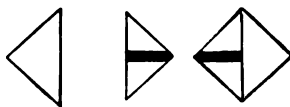


FIG. 4.



Chi Donan beacons.—These beacons lead in the fairway of the entrance to the Chi Donan, and consist of a pair of beacons on Tanjong Sodong (*Lat. $7^{\circ} 45' S.$, Long: $108^{\circ} 59' E.$*), exactly similar to those marking the entrance to Chilachap harbour; they should be kept in line on the bearing 176° true.

Harbour.—The channel up to Chilachap is very narrow from abreast of Karang Bolong, and between the end of the hard sandbank and Karang Rempak it is little more than one cable wide, but steep-to

General charts 1653, 941a.

Plans of Chitando and Chilachap inlets on 932. Var. 0° 50' E.

on both sides; the depth in the middle of the channel is from 4 to 10 fathoms, and $3\frac{1}{2}$ fathoms near the edge of the bank on the northern side. The bight of Chilachap, which is one mile wide between South point and Green point, contains a soft sloping mudbank, which dries out to the ends of the piers at low water springs; with South point in line with the flagstaff at Karang Bolong there are not more than 3 fathoms depth between the points.

The channel is too narrow to work in; and therefore sailing vessels must be warped in, if the wind be contrary. Good anchorage ground will be found throughout the channel.

Batu Berambang, with $2\frac{1}{4}$ fathoms over it, lies on the western side of the channel, one cable's distance from the shore, and 159° true from the left extreme of the battery on South point. The rock is to the southward of the alignment of the western pair of screens, and, in addition, may be avoided by keeping Tanjong Sodong open of Tanjong Agung.

Outer anchorage.—The best anchorage outside the channel is in $6\frac{1}{2}$ to 8 fathoms, with the lighthouse (*Lat. $7^\circ 46'$ S., Long. $109^\circ 2'$ E.*) bearing 203° true, distant $1\frac{1}{2}$ miles. Vessels waiting for pilots can anchor about half a mile from the shore in 5 to 6 fathoms, with Karang Bolong bearing 234° true and the lighthouse 197° true.

Winds.—In the morning, before 8 or 9 o'clock, there is generally a gentle land breeze from the west or west-north-west, enabling sailing vessels to go out in the south-east monsoon. Then in both monsoons it is calm till 11 o'clock, which allows ships to warp or tow during the north-west monsoon. From the middle of July, however, till the beginning of October, there are continued easterly winds, and in August and September they are accompanied by heavy rains, and sometimes storms, with no westerly or land breeze at all.

Pilot.—The pilot (there is only one) is not obliged to take in sailing vessels of over 20 feet, or steamships of more than 22 feet draught; and pilotage is compulsory for merchant vessels drawing more than 5 feet. Vessels are forbidden to enter at night or in thick weather when the marks are hidden. Two or three hours are required for the pilot to reach the harbour entrance; and vessels needing the pilot outwards must give 6 hours' notice to the Harbour master.

Signals for the pilot from ships approaching will, between sunrise and sunset, be acknowledged from the lighthouse on Chimiring hill, and repeated at the Signal station on Tiga hill. A blue flag will be hoisted when wind and sea prevent the pilot coming out.

The pilot sloop is black, with a white letter T on each bow. Vessels should not close with her until she has hoisted a blue flag with a white letter T, the signal that the approach to her is free of danger.

General charts 1653, 941a.

Plans of Chitando and Chilachap inlets on 932. Var. 0° 50' E.

Directions.—Vessels bound to Chilachap should steer for the eastern end of Nusa Kambangan, which from the southward is very conspicuous, and may be recognised by the lighthouse and the bluff head of Karang Bolong. In clear weather, and when the mountains are not hidden by clouds, the conical peak of Slamet will be an excellent mark; Karang Bolong will be in line with it on the bearing 18° true. When within 5 or 6 miles eastward of Kambangan some hills will be discerned, which are situated near the shore eastward of the Chi Serayu, and have the appearance of islands.

The entrance is too intricate for navigation by night, and vessels should then anchor off Kambangan, or keep to the eastward to prevent being drifted away by a westerly current, which sometimes runs at a rate of one knot.

With westerly winds there is no great swell under the lee of Nusa Kambangan, and vessels awaiting the pilot may anchor north-east of Karang Bolong as soon as they are sufficiently sheltered. During the south-east monsoon, when wind and sea are too high, the above anchorage would not be safe, and then vessels should stand off and on in the offing, unless so far acquainted with the place as to be able to run inside Bolong head, where they will be protected from the wind, and not much incommoded by swell. While waiting outside, Bolong head (*Lat. 7° 45' S., Long. 109° 2' E.*) should not be brought to bear southward of 226° true, to avoid the hard sandbank north of the entrance.

Harbour anchorage.—The inner anchorage off the town is in $4\frac{1}{2}$ to 6 fathoms, sand and mud, with the warehouses bearing 23° true. The deepest water will be found near the Kambangan shore, which is steep-to. It is advisable to moor, with 30 fathoms on each cable.

Tides.—It is high water, at full and change, at VIIt. 25m. Springs rise 6 feet; neaps rise 4 feet. The highest tide occurs two or three days after full and change.

Tidal streams.—The flood stream sets south-west over the hard sandbank, and then partly turns west-south-west. Abreast Karang Bali, the flood sets south and south-west, and in the north-west monsoon south-south-east towards Banju Njapa in the deepest part of the bight, whence it follows the westerly trend of the channel. When the hard sandbank is dry the streams naturally set along its edge. To the westward the stream follows the direction of the channel into Segara Anakan, where it meets the flood stream from Chitando inlet. The ebb stream runs in the contrary direction, sweeping round the bight of Banju Njapa, and then north-east through the narrows, or crossing the hard sandbank to the north and north-east.

General charts 1653, 941a.

Plans of Chitando and Chilachap inlets on 932. Var. 0° 50' E.

The velocity of these streams is variable; at spring tides it runs 2 to $4\frac{1}{2}$ knots, and in the rainy season the ebb even reaches $5\frac{1}{2}$ knots.

Supplies.—Provisions of all kinds are abundant, and drinking water can be obtained on the quay. Timber for spars is procurable. There is a Government store of coal on the bank of the Chi Donan. On the quay there is a 15-ton crane, and two travelling cranes of 3 tons each.

Population.—In 1905, the population of Chilachap was 16,289, including 295 Europeans and 894 Chinese.

Quays.—Alongside the quay, which is 1,326 feet long, on the east bank of the Chi Donan there is a least depth of 15 feet water; all vessels now discharge or take in cargo at the quay, as there are no boats or lighters available for working cargo at the harbour anchorage. If the wharf is occupied, vessels must wait their turn for a berth. Repairs can be executed at the shops of the Staatspoorweg Maatschappij.

Communications.—The railway connects Chilachap with Batavia, also Surakarta, Surabaya, and Semarang. There is a telegraph station at Chilachap.

Climate.—The climate cannot be considered healthy during the north-west monsoon, and malignant fevers prevail sometimes after a long drought, and during the rainy season. In the south-east monsoon, however, there are always fresh breezes, and Chilachap is then as healthy as any port in Java.

The heaviest rainfall is from October to January, when rain occurs 20 days in each month. The driest months are August and September, when rain falls about 11 days in each month.

Chart 1653, Island of Java, western portion.

SCHILDPADDEN BAY is the long bight between Nusa Kambangan and Tanjong Karang Bata. This bight is without dangers, and has good holding ground of 9 to 21 fathoms throughout, except near the line of breakers. Some rivers that discharge into it, carrying out trees and shrubs in abundance, cause irregular currents with patches of discoloured water and ripples. During the south-east monsoon the bay affords no anchorage for ships, at least, not unexposed to much wind and swell, for although Tanjong Karang Bata offers some partial shelter near the village Aiah, by which landing is rendered less dangerous than at any other place, yet the promontory does not project enough to afford a safe anchorage.

Tanjong Karang Bata (Lat. $7^{\circ} 47'$ S., Long. $109^{\circ} 25'$ E.) is a promontory of steep and inaccessible rock. Heavy surf prevents land-

General charts 1653, 941a.

Chart 1653, Island of Java, western portion. Var. $1^{\circ} 10' E.$

ing, and many instances are on record of boats and praus having been upset when endeavouring to land there, and of large trading praus, as well as other vessels, wrecked. When seen from the eastward, Tanjong Karang Bata seems to be surrounded by low land, and is a notable mark for ships bound to Chilachap. From the south-east or southward it has the appearance of an island with peaked hills.

Coast.—From Tanjong Karang Bata the coast stretches approximately 108° true for 55 miles as far as the mouth of the Kali Opak in about long. $110^{\circ} 17' E.$ without any known anchorage, although 9 and 7 fathoms have been reported at some distance off-shore: the charts show soundings of 27 fathoms at 12 miles distance. The coast is less steep than further eastward, and the beach rises into a chain of sand dunes about 25 feet above the sea.

Eastward of Kali Opak a barren uninhabited coast of chalk mountains, fronted by a continuous line of breakers, stretches eastward for 50 miles to Pachitan bay.

Plan of Pachitan bay on 932.

PACHITAN BAY is one mile wide at the entrance, between Tanjongs Karang Semondo and Ngamber (*Lat. $8^{\circ} 17' S.$, Long. $111^{\circ} 3' E.$*), but expands within to a length and breadth of 2 miles. As the bay is open to the southward it cannot be considered quite safe, for the continual high southerly swell causes vessels to roll heavily; the holding ground is, however, good, consisting of black sand mixed with clay, in 8 to 14 fathoms water. The whole north side of the bay is lined with a beach of white sand, but the high surf renders it impracticable for landing. The other shores consist of inaccessible rocks, upon which the waves break with considerable force. View on plan.

The Kalis Pachitan and Kuchur enter on the north-east and north-west sides of the bay; but access to them is generally very difficult, as there is often a dangerous sea, especially at ebb tide.

Anchorage.—There are but two places in Pachitan bay where boats can land; the first is on the western side, near a small strip of white sand named Temperan beach, where is also the watering place; the best anchorage is east of this beach in 8 fathoms water. The other landing place is in Pollux bay (Megelon bay), near the eastern point of the bay, which though very small is large enough to contain a single ship with anchorage in 10 to 12 fathoms. Pollux bay is quite landlocked and very little swell enters it, but communication with the chief town of the district, Pachitan, on the Kali Pachitan, is difficult across the intervening mountains.

General charts 1653, 1654, 941a.

Plan of Pachitan bay on 932. Var. 1° 10' E.

Tides.—It is high water, full and change, at IXh.; springs rise about 7 feet.

Directions.—Vessels bound to Pachitan bay ought to steer close along the shore so as not to miss the entrance during the night; the bay opens on a northerly bearing, and is then easily discerned. The fair track into the bay is midway between the two entrance points, on both of which a high surf always breaks.

Chart 1654, Island of Java, eastern portion.

Coast.—From Pachitan bay the coast stretches eastward for 19 miles to Pangul bay with some indentations, of which Damas bay is the principal, but this bay is too small and too exposed for anchorage. The coast is high, rocky, and lined by continuous breakers.

Reef.—Eastward of Damas bay is a reef about one mile off-shore (Lat. $8^{\circ} 17' S.$, Long. $111^{\circ} 19' E.$), which breaks heavily.

Plan of Pangul bay on 932.

PANGUL BAY affords good anchorage during the south-east monsoon, and is frequently visited by coasting traders; but during the north-west monsoon the bay is not safe, as it is entirely open to the south-west. Two small rivers enter the bay; the Pangul, on the northern shore, is navigable for small praus; the Puchong, on the eastern side, is not navigable.

Selu Jaran rocks (Sero) (Lat. $8^{\circ} 20' S.$, Long. $111^{\circ} 26' E.$), one mile from the south-east point of Pangul bay, are a low islet with a group of rocks, 3 cables southward of it, which are sometimes covered, but usually marked by high breakers. The passage between these rocks and the south-east point of Pangul bay appears free of danger, but the plan of the bay shows no soundings in the locality.

Anchorage.—The ordinary anchorage in Pangul bay is near the north-east shore in 7 or 8 fathoms, sand, abreast of the Government salt stores, but as a vessel is exposed there to a dangerous swell and the landing is troublesome, it is preferable to anchor a little more southward in Jaketra bay, a bight north-eastward of Pulo Kongilang. This bight is 3 cables wide, but the holding ground is good, sand and clay, in 7 to 5 fathoms. The bottom rises gradually towards a sandy down, upon which stand the coffee stores; and there is a pier which greatly facilitates the transfer of cargoes, as well as the intercourse of boats.

Rocks.—A group of drying rocks, about a cable in extent, lies 3 cables off a point $2\frac{1}{4}$ miles south-eastward of Pangul bay.

General charts 1653, 1654, 941a.

Chart 1654, Island of Java, eastern portion. Var. 1° 20' E.

Kapanean islands.—Two rocky islands, Prenjono (Prenjana) and Panian, about 2 miles off the coast between Pangul and Sumbreng bays, serve as good marks for making these bays. Panian (*Lat. 8° 22' S., Long. 111° 31' E.*), the south-easternmost island of the two, is 3 miles south-west of Sumbreng bay.

SUMBRENG BAY is far inferior to Segoro Wedi bay in extent, safe anchorage, and convenient landing places. It is 2 miles wide at the entrance, and contains no dangers except the rocks round the small island of Sroyu, near the south-east point, and Gevos reef, which lies 2 cables 159° true from Sroyu island, and shows above water. The depth at the entrance is from 35 to 40 fathoms.

The sides of the bay consist of steep, rocky cliffs, connected by a sandy beach about 2 miles in length. At each end of this beach, upon which there is always a high surf, there is the mouth of a river. At the mouth of the eastern river there are rocks which cover at high water, and are very dangerous when there is the least swell; the water, however, is very good, and firewood is abundant. The western river is not so deep, and its mouth is so filled up with rocks that boats cannot enter.

Anchorage.—The best anchorage in the south-east monsoon is in the small bight of Krokoan, close northward of Tanjong Pakis on the eastern side of the bay. The depths decrease towards the beach to 10 and 6 fathoms, but a ship, though sheltered from south-east and southerly winds, will be exposed sometimes to a heavy swell for which reason this bay is not recommended at all seasons. During the north-west monsoon, a vessel will find good anchorage in Puro bight on the western side of the bay, abreast of a sandy beach, towards which the depth shoals regularly to 6 fathoms. Communication with the interior is difficult across the steep mountain ridge.

Coast.—From Sumbreng bay the coast trends eastward generally for 10 miles to Segoro Wedi bay, forming certain points and small bights, but not offering anchorage ground. The depth of water near the shore is considerable, and landing would be dangerous on that rocky coast, which is, besides, not well known; there is a breaking reef 2 miles south-eastward of Sosari in about *Lat. 8° 23½' S., Long. 111° 40½' E.*

Plan of Segoro Wedi bay on 932.

SEGORO WEDI BAY is one of the finest bays of the whole island of Java; it is 1½ miles wide at the entrance between Gunung and Klappa islands, and penetrates 4 miles to the northward. The depth at the entrance is 40 fathoms, and from thence it shoals regularly

General charts 1654, 941a.

Plan of Segoro Wedi bay on 932. Var. 1° 20' E.

to 4 fathoms at the head. Outside of the bay, within 3 miles of the coast, there are several small islands, and some of these rise from 120 to 200 feet above the sea; they serve as leading marks to the entrance. All these islands, as well as the adjacent coast, are steep-to, rising abruptly out of the water, so that a vessel may pass them with safety on either side. Views on plan.

Pulo Babadan and Pulo Skel.—Pulo Babadan consists of two needles, elevated 40 or 50 feet, standing on a reef which projects one cable's length to the northward of the rocks, and is usually covered by high breakers. Pulo Skel is a rock always above water, and may generally be discerned at a distance by the surf on it. Both these rocks are steep-to, and in daylight may be approached very near. The passage between them has a rocky bottom and irregular soundings.

Pulo Batang is above water except at high spring tides, but may generally be discerned at a distance by the breakers on it, especially in bad weather; it is steep-to, and must not be approached at night, as the lead gives no warning of its neighbourhood.

Solemo rocks (Nusa Lima) have little or no vegetation on them; the westernmost is the lowest.

Pulo Boiyo Langu (Baia Langu), Pulo Tamengan, and Pulo Anakan form a group close together, about 3 miles east of Klappa island.

Pulo Sosori (Losari) (*Lat. 8° 21' S., Long. 111° 48' E.*), the easternmost of the islands at the entrance of Segoro Wedi bay, lies 2 miles 156° true from Tanjong Wot Jalu.

Bergat rock, existence doubtful, covered by 3½ fathoms water, was reported to be 1½ miles 98° true from the south point of Gunung island. The rock was searched for by the Dutch surveyors in 1839, and not found; but a knoll of coral with 9 fathoms over it was found about half a mile 294° true of the above position. Large vessels should not pass over the assigned spot.

Anchorage.—Segoro Wedi bay divides into two arms, Gongso bight (Labuan Gangsa) and Damas bight (Labuan Domas). On the eastern side of the former vessels will find anchorage, sheltered during the south-west monsoon, with Pulo Rembeng, a conical islet near the shore, 209° true, and Pulo Kerang Pegat 325° true. There are no dangers except Manok rocks (Selu Manuk), the points of which are a few feet above water. Another good anchorage is near the head of this bight, on the north side of Pulo Kerang Pegat, off the village of Ngessrep, in 6 fathoms, sheltered from southerly and easterly winds.

The anchorages along the western shore of the bay are not safe, and with a southerly wind even those on its eastern side are not exempt

General charts 1654, 941a.

Plan of Segoro Wedi bay on 932. Var. 1° 20' E.

from a heavy swell that rolls in; while with south-easterly gales sudden gusts of wind come down from the mountains, but they are not of long duration.

Mountains.—Three or 4 miles inland there is a steep and rugged chain of mountains, from 1,500 to 2,000 feet high, which forms the boundary between the districts of Prigi and Kampak; and over which it is very troublesome to transport the products of the Regencies Ngrowo and Trengalek.

Tides.—As a general rule the highest tides occur in Segoro Wedi bay from one to three days after full and change, at IXh.; low water then occurring at IVh., the rise at such times being from 8 to 10 feet.

Currents.—In September, near Pulo Skel, a current of $2\frac{1}{2}$ miles an hour has been known to run to the eastward; therefore vessels are recommended not to weigh without sufficient breeze to carry them clear of the islands.

Water.—Fresh water may be obtained at the head of the bay, near Ngessrep village (*Lat. 8° 17' S., Long. 111° 44' E.*). Water may also be procured from the little Kali Pancher; but boats must enter this river at high water on account of the rocks near its mouth. A high surf always runs up on the northern beach.

Chart 1654, Island of Java, eastern portion.

Gemak and Bumbun bays.—Between Tanjong Wot Jalu, 3 miles eastward of Segoro Wedi bay, and Tanjong Pakis, $6\frac{1}{2}$ miles further eastward, there is a deep bight receding 4 miles to the northward and divided into two parts by a rocky promontory. The western part is named Gemak bay, and the eastern Bumbun bay. In general the coast here is rocky and very steep, but with the exception of a reef which lies 3 cables off Tanjong Wot Jalu, there are no dangers.

At the entrance of Gemak bay the depth is 32 fathoms, decreasing regularly to 20, 10, and 7 fathoms at the head and abreast of Tanjong Lemiring. Near Popoh village the water shoals gradually, and a vessel may anchor there conveniently in 6 fathoms, good holding ground, under Tanjong Lemiring, which is steep-to, with 10 and 6 fathoms close to the rocks. The northern and western sides of Gemak bay are unsafe during the south-east monsoon, and even the above anchorage off Popoh is not always safe at that season, as the bay is wholly open to the wind and sea from the south.

This bay has seldom if ever been visited by ships, and no praus are to be found here, only very small fishing canoes. Wood and water can be procured from Popoh, which is a small village of 150 inhabitants, but no provisions.

General charts 1654, 941a.

Chart 1654, Island of Java. Var. 1° 20' E.

Bumbun bay lies 3 miles to the eastward of Gemak bay. The western point of the bay is a flat rock bearing some resemblance, at a distance, to a dismantled wreck. The eastern point, Pakis, is rocky and the hills near it are high and steep towards the sea; a round hill rises on the point. The depth of water decreases regularly from 45 fathoms at the entrance to 3 fathoms off a small beach near the western point, where there is good anchorage. With southerly winds a high sea sets into this bay, but as the wind draws to the eastward the water becomes smooth; the bay however is unfit to be used in the south-east monsoon.

Communication with the interior is more convenient from here than from any of the other bays of the south coast, as the crests of the intervening hills are only 300 to 400 feet in height.

Coast.—From Bumbun bay the coast trends 100° true for about 50 miles to Sempu island, and consists of a ridge of steep rocks fronted by an uninterrupted line of surf. The shore has never been minutely examined; the depth of water is very great at a short distance off.

Sempu island (*Lat. 8° 26' S., Long. 112° 42' E.*), 853 feet high, is 5 miles in length and consists of high rocks, like the adjacent coast. It is separated from the main by a channel a quarter of a mile in width, with numerous rocks and small islets in it; it was visited in 1837, but never has been sounded.

Dampar bay.—To the eastward of Sempu island the coast is indented with three small bays, the easternmost of these, Peletot bay, is a mile long and half a mile wide at the entrance, but the depth of water in it is not known. Further eastward the coast makes a wide bend and is unexamined. The western part of this bend is rocky, and it is said that dangerous reefs project some distance from the shore under water. At the head of the bend, some 12 miles, 56° true, from Peletot bay, is Dampar bay, also unknown.

The eastern shore of the bend is lined by a sandy beach, which rises into sandhills. Several rivers discharge into this part of the coast; the largest of them, the Getem, Sayang, and Bambang, have wide entrances and good water, but each has its sandy bar, which occasions a heavy surf, and in most cases makes landing impracticable.

To the westward of Dampar bay the country inland is mountainous, and in clear weather a good mark to correct the reckoning by is Mount Semeru, 12,061 feet high and visible 60 miles.

Baron (Barung) island, about 3 miles off-shore, is 9 miles in length and 4 miles in width. The south side is low near the sea, but the south-west, south-east, and east sides are steep and rocky, of con-

General charts 941a, 941b, 2759a.

Chart 1654, Island of Java. Var. 1° 40' E.

siderable height and discernible at a long distance. On the north side of the island there is a small bay where tolerable anchorage may be had in the north-west monsoon, in 27 fathoms, but in most places the island should not be approached within half a mile, as there are appearances of reefs under water. From the east point of the island Mount Semeru bears about 306° true.

Puger.—Abreast of Baron island is the projecting Tanjong Pelindu, bearing 335° true from the east end; 5 miles eastward of Tanjong Pelindu is the village of Puger, where some provisions and water may be obtained. The road can only be approached in the north-west monsoon, and with the greatest caution because of the rocks and breakers that line the shore. The river is navigable by small vessels only. The depth between the Java coast and Baron island is from 23 to 46 fathoms.

Coast.—From Baron island to Grajagan bay, a distance of 50 miles, the coast is steep, rocky and barren, forming a chain of small bays, and lined with several islets and rocks which make the approach dangerous.

Plan of Grajagan on 2732.

Grajagan bay (Lat. 8° 35' S., Long. 114° 30' E.), to the westward of Blambangan peninsula, is 9 miles wide, and is said to afford good anchorage in the south-east monsoon in 14 to 8 fathoms water. The village of Grajagan stands in the north-west angle of the bay on the bank of a small river, but landing is difficult, as the coast is very steep, and with westerly winds the bay is unsafe. Neither provisions nor water can be procured.

Chart 3726, Bali strait.

Tanjong Bantenan, or South point of Java, is the southernmost projection of the great Blambangan peninsula, which forms the south-eastern extremity of Java. From Tanjong Bantenan the coast curves round gradually, trending generally east-by-north for 4 miles to Tanjong Karang Inte or South-east point. This part of the coast seems to be fringed with reefs under water to a mile off-shore, with 20 to 25 fathoms close outside, and 70 fathoms at 4 miles distance. The sea breaks constantly, and the impracticability of anchoring in such great depths makes it advisable for sailing vessels to keep at some distance off, especially in calms and light airs.

General charts 1654, 941b, 2759a.

Chart 3726, Bali strait. Var. 1° 50' E.

LIGHT (*Lat. 8° 46' S., Long. 114° 31' E.*).—A *white flashing* light, showing a flash of *four-tenths of a second* duration *every five seconds*, is exhibited, at an elevation of 253 feet, from a white iron framework, 69 feet in height, situated on Tanjong Bantenan. It is visible from a distance of 21 miles. For the arc of visibility, *see* Light list and charts.

The east coast of Java and Bali strait, pages 152-162.

General charts 1654, 941b, 2759a.

CHAPTER VIII.

ISLANDS EAST OF JAVA—BALI, LOMBOK, SUMBAWA, AND KOMODO
ISLANDS: LOMBOK, ALAS, AND SAPEH STRAITS: PATER-
NOSTER AND POSTILLON ISLANDS.

VARIATION IN 1914.—Stationary to increasing one and a half minutes
annually.

Chart 941b, Eastern archipelago, western portion.

WINDS AND WEATHER.—In that portion of the sea between Celebes and the islands east of Java the characteristic features are steadiness in direction of both monsoons, and the prevalence of the eastern over the western; a small rainfall, and high percentage of haziness.

The eastern monsoon blows with force from east-south-east between the latter half of April and October, being strongest in June, July, and August.

In December the western monsoon sets in from west-north-west, and attains its maximum in January. In February the strength of the wind begins to abate, and in March the direction varies between south-west and north.

The dry season is from May to November. The greatest rainfall, about one day in three, is in December and January, and squalls are then most frequent. The sky is seldom clear; in the western monsoon it is generally overcast, and in the eastern very hazy.

Near the northern shores of the islands, winds in both seasons are steadiest in the night hours, and less reliable by day, being influenced by land and sea breezes; and longer periods of changeable winds and calms, between the monsoons, may be expected.

Southward of the Sunda islands strong winds, overcast skies, and showery weather prevail, and a very hazy atmosphere during the south-east monsoon, with heavy swell and high seas.

The south-east monsoon begins early in March, with winds from south-east to south, and blows most steadily from June to September, between south-east and south-south-east.

In November variable winds are experienced, and it is only during December, January, and February that westerly winds blow, between south-west and west, and these are never reliable.

General chart 2759a.

Chart 941b, Eastern archipelago.

January and February are the wet months, when heavy squalls and thunderstorms are frequent.

Within the influence of the islands, winds are at all times less reliable in direction and strength, and rain, as on the south coast of Java, depends greatly on local physical features of the land.

In and near straits and passages the winds always draw through, being strongest in the narrow parts; and when tidal streams run contrary to currents and winds, races, eddies, and dangerous breaking seas may be found.

Currents generally run with the wind, but trend south-eastward in the west monsoon and south-westward in the east monsoon.

Chart 1654, Island of Java, eastern portion. Var. 1° 50' E.

BALI ISLAND, next east of Java, is about 80 miles in length, east and west, and from 15 to 45 miles in width. It is mountainous throughout, the main chain running from west to east in apparent continuation of that of Java. There are several active volcanoes, the highest, Mount Agung, sometimes called Bali peak, is 10,187 feet high. The people are of the same race as the Javanese, and are quite undistinguishable from them in physical character; they speak a peculiar language, a variety of the Malay, and write with the Javanese character. The population, with Lombok, in 1905, was 523,555. The country is divided into eight semi-independent States, each under a Rajah, but the whole island is under the Dutch Resident at Buleleng, on the north coast, the chief port in the island.

NORTH COAST.—Tanjong Pasir and Menjangan island have already been described with Bali strait, page 160.

Plan of St. Nicholas bay on 2732.

St. Nicholas or Chelukan Trima bay is 6 miles east of Tanjong Pasir (*Lat. 8° 6' S., Long. 114° 26' E.*); the northern part of the bay appears to be free from dangers, but is too deep for anchorage; in the southern part there are two dry reefs, and many other dangers exist. The eastern side of the bay is lined by a reef which extends round the coast to the eastward, and nearly closes the entrance to Banjuwedan bay.

Chart 3726, Bali strait.

Sandang hill, 5 miles east of St. Nicholas bay, is close to the shore, and has a small sandy beach on the eastern side, sheltered by reefs which make the approach so difficult as to be only practicable from the westward. Several reefs lie off this part to a distance of one mile; between the reefs, which may be discerned at a distance by the colour of the water over them, there are passages for praus.

General charts 1654, 941b, 2759a.

Chart 1654, Island of Java. Var. 1° 50' E.

Tanjong Gundul is a small peaked and bare hill, which may be known by its yellow colour, standing on a low tongue of land projecting to the northward. The headland is bordered by a reef, and has on each side a small bay with a sandy beach in which praus can find shelter; in the western bay, Ayer Poh, there is anchorage for ships in 14 to 20 fathoms close to the beach. Three-quarters of a mile 23° true from Tanjong Gundul there is an extensive reef of oval shape, with 2 fathoms water over it, 20 fathoms near its northern edge, and 23 fathoms between it and the point; with a fair wind vessels can pass between the reef and the shore. Another small reef, covered by one fathom, with 18 fathoms on its northern edge, lies 305° true, distant 1½ miles from the point.

Eastward of Tanjong Gundul, and off the shore of Chiluang Bawang bay, many reefs extend out about a mile.

Plan of Temukus road on 934.

Temukus road (Lat. 8° 10' S., Long. 115° 0' E.) is the best on the north coast of Bali, being sheltered from north and north-west winds by a dry coral reef nearly 2 cables off-shore, within which vessels may lie in safety in 14 fathoms, but they should moor west-south-west and east-north-east in mid-channel in order to swing clear of the shoal water on either side. Vessels making a short stay may anchor in 21 fathoms, 1½ cables westward of the reef. Between Pengastulan village to the westward and Tanjong Kalibubuk to the eastward are many dangerous reefs extending to three-quarters of a mile from the shore. Vessels bound to Temukus road should keep the dry reef, on which there was a small house and some trees, on a southerly bearing, round it closely on either side, and anchor to the southward.

Tides.—It is high water, at full and change, at Vh.; springs rise 6½ feet. Generally there is only one flood and one ebb in the 24 hours. The flood stream sets to the eastward, and the ebb to the westward.

Plan of Buleleng road on 934.

Buleleng road extends from Tanjong Buleleng to Tanjong Panarukan; there is anchorage all along the shore in from 15 to 20 fathoms at a distance of 1½ to 2 cables, but it is not very safe during the north-west monsoon; the best anchorage at that season is within Panarukan bank.

Buleleng (the seat of the Dutch Resident of Bali) is a free port. Rice and coffee are exported in considerable quantities. A short wooden pier facilitates landing in fine weather; when there is a surf landing can only be effected in flat-bottomed boats, these are run on to the sand, and then hauled up on shore.

General charts 1654, 941b, 2759a.

Plan of Buleleng road on 934. Var. 1° 50' E.

LIGHTS.—A white occulting light every six-tenths of a second, showing eclipses of three-tenths of a second, is exhibited, at an elevation of 58 feet above high water, from a white iron framework, 46 feet in height, situated to the eastward of the river entrance. It is visible from a distance of 12 miles, and is obscured when bearing west of 227° true.

A red fixed light is exhibited from the pierhead.

Panarukan reef, one mile north-eastward of the lighthouse, is two coral patches with from 5 feet to 2 fathoms water.

Buoy.—A black conical buoy is moored northward of the 5-foot rock.

Communication.—Buleleng has a fortnightly mail service with Surabaya.

Telegraph cable.—A cable is laid from Landangan, near Tanjong China in Java, to Buleleng, and thence to Makassar, and another to Ampenan.

Prohibited anchorage.—Vessels are not to anchor near the telegraph cables in the south-western part of the road.

Plan of Sangsit road on 934.

Sangsit road, on the eastern side of Tanjong Panarukan, is quite exposed, and the depth of water in it is very irregular, with rocky ground in some places; good holding ground may, however, be found in 14 fathoms off a house with a red roof on the beach.

Plan of Bungkulan road on 934.

Bungkulan road (Lat. 8° 3' S., Long. 115° 8' E.). — Tanjong Bungkulan is the northernmost point of Bali island; between this point and Tanjong Batu, 5 miles to the south-east, there is an open road with depths of 11 fathoms, soft mud and sand, 3 cables off-shore, but neither here nor anywhere on the entire north-east coast of Bali is there sheltered anchorage. A 6-fathom patch lies $1\frac{3}{10}$ miles eastward of Tanjong Bungkulan.

Chart 1654, Island of Java, eastern portion.

Tanjong Gulah is 10 miles 106° true from Tanjong Bungkulan. The high mountain range here nearly reaches the coast, and a high steep-to shore extends 30 miles, to the east point of Bali; there is a deep cleft or ravine near the point of Tianjar.

Plans of Tianjar, Kubu, and Ambat roads on 934.

Julah, Tianjar, Kubu, and Ambat roads.—Immediately westward of Tanjong Gulah is Julah anchorage, one cable off the village, in about 25 fathoms water, with Tanjum or Saddle hill 257° true. Tianjar road, 11 miles east of Tanjong Gulah, has anchorage in 24 fathoms, with a high tree near some red-roofed houses, bearing 196° true, distant 4 cables. Kubu road, 7 miles from Tianjar, is small, but the holding ground is good about one cable from shore in 26 fathoms, off the salt pans. Labuan Ambat is 23 miles

General charts 1654, 941b, 2759a.

Plans of Tianjar, Kubu, and Ambat roads on 934. Var. 2° 0' E.

from Tanjong Gulah and 7 miles from the east point of the island; the anchorage, in 17 fathoms, is a cable from shore, abreast the village, with Mount Agung 267° true.

These anchorages are exposed, and the sea breeze quickly brings in a heavy surf upon the beach.

Plan of Labuan Amuk and Ujung road on 934.

SOUTH-EAST COAST.—Ujung road.—Tanjong Karang Asem is the easternmost point of Bali; close off it lies the islet Manuk, 39 feet high. Ujung road, 5 miles south-west of Tanjong Karang Asem, is the landing place for the chief town of the district of that name; it cannot, however, be considered a secure anchorage, and even after days of calm weather a heavy surf strikes on the beach. A small reef projects to half a cable's length off the village, and at one cable from the shore the depth is 10 fathoms. Anchorage may be had off the village, about 2 cables from the shore, in 14 fathoms, black sand, with the village in line with Mount Agung bearing 310° true, and Gili Biaha 209° true.

Gili Biaha and Gili Tepekong.—Gili Biaha, 59 feet high, lies about 2 cables to the south-eastward of Tanjong Bias Putih, and is separated from it by a deep channel of 22 fathoms.

Gili Tepekong (*Lat. 8° 32' S., Long. 115° 35' E.*), 167 feet high, is about 8 cables to the southward of Tanjong Bugbug, a steep point descending from Mount Bugbug, 945 feet high.

Half a mile to the north-westward of Gili Tepekong, on a drying reef 3 cables in length, are some rocks above water. The passages between this reef and Tepekong and the reef and Tanjong Bugbug are clear.

Labuan Amuk is safe during the north-west monsoon, and there is little surf on the sandy beach. The depth decreases regularly from 24 fathoms half a mile distant to 10 fathoms 2 cables from the beach. The best anchorage is in 12 fathoms, about a quarter of a mile off-shore, with Gili Tepekong bearing 108° true, and Tanjong Sari 189° true. In the southern part of the bay the bottom is rocky.

Telok Padang, separated from Labuan Amuk by Tanjong Sari, is nearly filled up with reefs, which leave only a small creek about a cable wide, in which small craft can find anchorage in 2½ fathoms. The water deepens rapidly, outside the cove, and 30 fathoms will be found at 2 cables distance. The village of Padang stands at the head of the cove, between clumps of trees; the cove is environed by a narrow valley bounded by a ridge of hills 500 or 600 feet high; this ridge is separated from the mountains by another valley.

Tanjong Sari may be known by a temple standing on it.

General charts 1654, 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 2° 0' E.

Tanjong Setra (Lat. 8° 34' S., Long. 115° 27' E.) is 4 miles west-south-west of Tanjong Sari. Off this part of the coast the water is deep, and soundings can only be obtained close in-shore. Anchorage, can be had off the village of Lebih, 5 miles west of Tanjong Setra, in from 15 to 18 fathoms, abreast of a red house, the village bearing 316° true, but it is unsafe in rough weather.

Plan of Pantai Timur and Sanur road on 934.

Sanur road.—The position of Sanur can be recognised from some distance, as the coast to the southward of the village is wooded, whilst to the northward there are cultivated fields with only one cocoanut tree.

Reef.—There is a coral reef fronting the village, with a channel between it and the shore. To the northward of the reef are small detached rocks.

Directions.—The fairway to the roadstead is indicated by two white beacons on the shore, which in line, on the bearing 279° true, lead clear of all dangers; the higher beacon is surmounted by a triangle, and the lower by a square.

Anchorage may be picked up on the leading line in 7 fathoms. The best landing is inside the coral reef, and is reached by continuing on the leading mark until close to the shore, then keeping to the southward.

Plan of Benoa channel on 934.

Pantai Timur, immediately north of Tafelhoek, is safe during the north-west monsoon, but the reefs in it only leave sufficient space for three or four very small vessels to moor in safety. The way into this road is by Benoa channel, southward of Serangan island; the channel, between dangerous reefs on either side, is but a cable in width, and is marked by white beacons and buoy on the northern side, and black beacons and buoys on the southern side, but they are not to be depended on, and it should not be entered without a pilot. When waiting for the pilot, who will come off from the village of Tuban in answer to the usual signal, a vessel may anchor in 5 to 10 fathoms east of Tanjong Benoa, with Nusa Dua bearing 181° true. Small vessels can warp inside, but as the tidal stream sets with great rapidity over the points of the reefs the process is dangerous.

Plan of Pantai Timur and Sanur road on 934.

Serangan island, fronting Pantai Timur, is low and bordered by a reef steep-to, which projects three-quarters of a mile east and south-east, forming the northern side of Benoa channel. From Tanjong Benoa, the southern point of the bay, the reef, on the south side of Benoa channel, extends south-east one mile, and following the shore southward encloses Nusa Dua, off the eastern extreme of Tafelhoek.

General charts 3726, 1654, 941b, 2759a.

Plan of Pantai Timur and Sanur road on 93½. Var. 2° 0' E.

Tides.—It is high water at full and change, about XIh.

Tafelhoek, Pantai Barat, and the west coast of Bali have been described in Chapter VI.

Chart 165½, Island of Java, eastern portion.

LOMBOK STRAIT is 19 miles wide between the eastern point of Bali and the opposite point of Lombok. The southern entrance is divided into two channels by Nusa Besar; either of these channels may be taken, but the eastern, which is 11 miles wide, is generally preferred. This strait is usually taken by ships arriving at the straits east of Java in January or February, but with contrary winds the passage through is difficult; the tides are rapid, with eddies through the middle of the strait, but there are a few places on either side where sailing vessels can find anchorage in light winds.

Winds.—During the south-east monsoon calms are frequent from sunrise to noon, when a fresh southerly wind arises, turning to south-east on the Bali side, and to south-south-west on the Lombok side, blowing strong during the night. In the north-west monsoon the winds are generally from north-west, sometimes with violent squalls, and a high sea in the northern approach.

Currents.—During the south-east monsoon the current southward is strongest, and during the north-west monsoon the current northward. In May and in August vessels have found a current of 4 knots setting to the southward, with a southerly swell; and again, during the north-west monsoon vessels have taken 10 to 24 days to get through the strait from the northward, and some have been carried back and forced to take Bali strait.

In April, 1885, between Timor and Bali strait a strong south-south-east current, about the time of flood in Bali strait, was experienced. When this current was met the colour of the water changed from clear blue to dirty green. When 40 miles southward of Lombok island a current was found setting southward from 4 to 5 knots.

Tidal streams.—The flood stream runs northward and the ebb southward with a velocity at springs of 3 knots, causing strong eddies and tide races; the eddies are less violent in the western channel than in the eastern. It is probable that both flood and ebb streams overrun the times of high and low water by the shore, but how much is unknown, and information on the set of the streams is much wanted.

Nusa Besar (Penide) island (*Lat. 8° 44' S., Long. 115° 32' E.*), at the southern entrance of Lombok strait, is 10 miles in length, north-west, about 6 miles in width, and 1,585 feet high; from the southward it appears as high tableland, with a small peak on the east end.

General charts 941b, 2759a.

Plan of west coast of Nusa besar on 934. Var. 2° 0' E.

Off the north-west side there are two smaller islands, Cheningan and Lembongan; from the north-west side of this last a reef projects about half a mile, and the two islands are joined together by a reef that dries. It is not safe for a sailing ship to approach these islands closely, owing to the strength of the tidal streams.

Chart 1654, Island of Java, eastern portion.

DIRECTIONS for LOMBOK STRAIT.—From southward.—In clear weather, when the peaks of Bali and Lombok are visible, Lombok strait may easily be distinguished at a distance of 25 miles from the entrance by the sharp peak of Mount Agung (*Lat. 8° 20' S., Long. 115° 30' E.*), at the east end of Bali island, and which bears 333° true from the middle of the entrance to the eastern channel; also by Mount Rinjani, which appears double when seen to the north-east, topping over the high western land of Lombok island; on approaching the strait the high cliffs of Nusa Besar will be observed.

When the breeze is blowing steadily it is advisable to keep in mid-channel, and afterwards nearest the Lombok shore to avoid being drifted on Nusa Besar if the breeze should fail and the ebb tide set out. Some vessels, however, find advantage in passing west of Nusa Besar, because the currents are less violent, and there is anchorage on the Bali shore.

From northward.—The peaks of Bali and Lombok also serve as good marks when approaching the strait, and a course should be steered to pass midway between Nusa Besar and Lombok. With an adverse current during the south-east monsoon, most progress will be made by keeping the Bali shore on board until Mount Agung bears 270° true. By stretching over then to Lombok a ship will very likely fetch the road of Ampenan, especially if the Bali side of the strait be left early in the morning for the sake of the sea breeze from southward. With a contrary current it is difficult to get down on the Lombok side of the strait, and on the Bali side after the peak bears northward of 270° true.

LOMBOK ISLAND is nearly square in form, with a narrow and somewhat elongated base which projects on either side; the mean length and breadth is about 40 miles.

Lombok occupies in general character an intermediate position between the islands lying to the west, which once formed a part of the Asiatic continent, and those lying to the east, which as surely belonged to Australia. Two mountain ranges pass through it from west to east, the northern wholly volcanic; the southern, which is a lower range, is of recent calcareous formation. Between these, and occupying the centre of the island, is an extensive plain, intersected by a line of volcanic hills not more than 100 feet above the level of the sea. In the north-east part of the island Mount Rinjani, or Lombok peak,

General charts 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 2° 0' E.

attains the height of 12,350 feet, and is consequently the highest land in the whole archipelago. There are no active volcanoes in Lombok, but many extinct craters, some of which contain water and form lakes at considerable altitudes.

The central plains and the lower mountain slopes are highly cultivated by means of an elaborate system of irrigation, the water for which is supplied by numerous small lakes and rivers. The production of rice is enormous, and great quantities are exported, as well as coffee, cotton, copra, hides, and ponies.

The north coast is straight and regular, but the south, west, and east coasts are broken by bays and inlets which afford fair anchorage according to the prevailing monsoons; of these the most frequented are the bays of Ampenan and Labuan Tring on the west coast, and those of Lombok, Labuan Haji, and Pijut on the east coast.

The climate is much drier than that of Java, probably due to the proximity of Australia, the south-east monsoon which lasts from March to November blowing over the northern part of that country, and continuing as a hot wind over the adjacent islands produces a degree of heat and dryness which assimilates the vegetation and physical aspect of the adjacent islands to its own.

The inhabitants of Lombok are called Sasaks. They are a Malay race allied to the Javanese and Bugis, but speaking a peculiar language written in the Javanese character.

WEST COAST of LOMBOK.—**Trewangan** (*Lat. 8° 21' S., Long. 116° 2' E.*) is the highest and westernmost of a chain of three islands extending 4 miles westward from Tanjong Sirrah on the north-west side of Lombok; the north point of the island is in line with Lombok peak, bearing 98° true. Between Trewangan and the point are the islands of Meno and Aér.

Reefs.—There is a reef, one cable in extent, with a depth of 4 fathoms and 11 to 20 fathoms around, 2 miles 73° true from the north point of Trewangan.

A reef, 2 cables in extent with 2½ fathoms water, lies with the north-east point of Aér, 212° true, 1¼ miles, and there is a depth of 6 fathoms 2¼ cables, 282° true, from this position; eastward of these a chain of detached coral heads extends to the land.

The channel separating Meno from Aér, and between the above reefs, is clear; the course from southward is with the rock off Tanjong Rumbek, bearing astern, 202° true, until the north point of Trewangan island is 247° true, thence as necessary.

General charts 941b, 2759a.

Plan of Kombal bay on 2732. Var. 2° 0' E.

Kombal bay (Lat. $8^{\circ} 24' S.$, Long. $116^{\circ} 6' E.$), southward of Tanjong Sirrah, has anchorage in about 9 fathoms, off the village of Baru and southward of dangers in the centre of the bay.

The western reef, small and steep-to, with $1\frac{1}{2}$ fathoms water, lies with Tanjong Sirrah, 24° true, distant $1\frac{1}{2}$ miles; nearly 5 cables, 80° true, from this is a small rock of 2 fathoms with 7 to 10 fathoms close around. The north-east point of Meno, just open of Aér, leads between these reefs. A patch with 5 fathoms water lies $1\frac{6}{10}$ miles, 234° true, from Tanjong Sirrah.

The coral bank lining the shores of the bay projects 2 cables from the south side, one cable from the east side, and 4 cables off, southward of Tanjong Sirrah, with detached rocks between it and Aér. The edge of the bank drops suddenly into deep water.

Steering for the anchorage from westward, the village of Baru should not bear southward of 115° true.

Early in February, when a strong north-west wind blew in the strait, it was observed that in this bay the wind was light from northward and north-east, and that the surf on the beach did not prevent landing.

Chart 1654, Island of Java, eastern portion.

Coast.—Between Tanjongs Kechinan and Santigi the coast is very mountainous, rises steeply out of the sea, and can be approached close-to.

Plan of Ampenan road on 2732.

AMPENAN, the chief place of trade in Lombok, is on the banks of a small stream $4\frac{3}{4}$ miles to the southward of Tanjong Santigi; the town of Mataran, the residence of the Dutch official and of the native Rajah, is about one mile inland.

Ampenan road offers tolerably safe anchorage during the south-east monsoon, inside the ridge of banks and shallow heads parallel to and about a mile from the shore. Between these reefs and the land there is a deep channel, leading to Labuan Tring; this, however, must not be attempted when it may be necessary to run to the latter port for shelter.

The roadstead is open and exposed at all seasons, and in the south-east monsoon a heavy swell from the Indian ocean will break with violence on the beach.

Dangers.—Santigi reef, of $1\frac{3}{4}$ fathoms, is situated $1\frac{3}{10}$ miles, 178° true, from Tanjong Santigi; a $3\frac{1}{2}$ -fathom patch lies three-quarters of a mile, and a shoal of 4 fathoms 2 miles, 159° true, from the same point.

Wilhelmina reef, with a depth of 6 feet, lies one mile, 328° true, from the lighthouse.

General charts 1654, 941b, 2759a.

Plan of Ampenan road on 2732. Var. 2° 0' E.

Medusa reef of 3 fathoms, is one mile, 254° true, from the lighthouse, and three reefs, with a least depth of $2\frac{3}{4}$ fathoms, extend for .3 miles to the southward.

In the southern part of Ampenan bay, at a distance of about .5 miles, 211° true, from the lighthouse, commences the eastern end of a line of coral heads, extending $6\frac{1}{2}$ miles, 260° true; the eastern part, for $1\frac{1}{2}$ miles, has a least depth of $3\frac{3}{4}$ fathoms, which increases westward to 8 fathoms. About one mile to the southward of the eastern end is a depth of $2\frac{1}{2}$ fathoms.

At a distance of one mile, 316° true, from Tanjong Grésak is a reef about one cable in extent with a depth of 3 feet, and depths 16 to 20 fathoms around; it is marked by discoloured water and breakers.

Three-quarters of a mile, 282° true, from Po islet is a small reef of $4\frac{1}{2}$ fathoms, distinguished by discoloured water.

Anchorage is in 10 fathoms, black sand, about half a mile from shore with Ampenan flagstaff in line with Mount Rinjani, 68° true; or more northward of Medusa reef in rather deeper water. The beach is steep, depths in some places decreasing very rapidly, and it is well not to come into less than 10 fathoms. Vessels should be prepared to weigh or slip on the approach of bad weather.

Sailing vessels in the north-west monsoon should anchor 2 miles off, to be enabled, if need be, to run for Labuan Tring.

LIGHT (Lat. $8^{\circ} 34' S.$, Long. $116^{\circ} 4' E.$).—A white group occulting light every thirty seconds, showing thus:—light, three seconds; eclipse, three seconds; light, twelve seconds; eclipse, twelve seconds, is exhibited, at an elevation of 41 feet above high water, from a white iron framework, 42 feet in height, situated near the flagstaff. It is visible from a distance of 11 miles.

Tides.—It is high water, at full and change, about VIIIh.; springs rise 6 feet. The tidal streams are not strong in the bay.

Mooring buoys.—Six mooring buoys have been laid out in Ampenan road by the Royal Netherlands Steam Navigation Company.

Supplies.—Cattle, poultry, fruit, and vegetables are abundant, and moderate in price. At high water ship's boats can water in the river, but at low tide the entrance is obstructed by a spit of sand.

Communication.—Every four weeks the mail steamer from Surabaya calls at Ampenan.

Telegraph.—A submarine telegraph cable connects Ampenan with Buleleng.

General charts 1654, 941b, 2759a.

Plan of Labuan Tring bay on 2732. Var. 2° 0' E.

Labuan Tring bay affords shelter in all winds. The western side of the entrance is bluff and readily distinguished, the eastern point is low, sandy, and covered with bamboos and brushwood. A vessel entering should keep nearest the eastern shore, with the low Tanjong Chemara bearing 170° true, in order to avoid a reef projecting 2 cables from the western point. When a high cliff point on the east side is seen, haul round the point and anchor in 10 fathoms, mud and clay, with the extreme of Tanjong Chemara about 327° true, distant 2 cables; the water here will be quite smooth at all times. The reef of Tanjong Kubur projects north-westward 2 cables. There is also good shelter on the western side nearer the head, in 7 fathoms; and a large ship may anchor in the centre of the bay in 11 fathoms, with Tanjong Kubur bearing 91° true. Although sudden squalls are felt in the north-west monsoon, it is only when the wind is north that any swell comes in.

Supplies.—There are three good wells near the huts on the eastern side of the cove; firewood and bamboos may be cut in plenty, but other supplies, except plantains and cocoanuts, are scarce. The cove is unhealthy during the north-west monsoon.

Chart 1654, Island of Java, eastern portion.

Tanjong Pandanan (Lat. 8° 44' S., Long. 115° 51' E.).—Between Labuan Tring and Tanjong Pandanan, a chain of islands and reefs front the shore from one to 2 miles off, and it is probable that anchorage may be found in some of the bays. Depths of about 25 fathoms were found a mile outside the islands. Rocks extend northward of the islets immediately west of Labuan Tring, and a reef projects a mile eastward from Ringgit.

There is a bank of sand and coral, with 10 to 25 fathoms, about 3 miles to the northward of Ringgit island; on this bank a vessel has anchored in a fresh south-east wind.

Coast.—From Tanjong Pandanan the coast trends generally to the southward for 5 miles to Tanjong Batu Gendang, the south-west point of Lombok, and is high and precipitous, rising abruptly to a height of 1,457 feet.

SOUTH COAST OF LOMBOK.—From Tanjong Batu Gendang the coast trends in a south-westerly direction for 10 miles to Tanjong Pangga, and is steep-to. About 1½ miles to the eastward of Batu Gendang is a sandy beach with a rocky islet 3 cables off, and some rocks that dry at low water round it. About 4 miles to the eastward of the same point is a small bay which affords the only anchorage west of Telok Blongas.

General charts 1654, 941b, 2759a.

Plan of Telok Blongas and Silung Belanak on 2732. Var. 2° 0' E.

Tanjong Pangga is the termination of a conspicuous saddle-shaped mountain 1,117 feet in height. About half a mile to the westward of the point is a small islet of the same formation and height as the coast; eastward of the point are three rocks above water.

Sophia Louisa rock, situated one mile to the southward of Tanjong Pangga, is about half a cable in diameter and 10 feet above water, with depths of 25 fathoms close alongside, and a clear channel between it and the shore. In clear weather it can be seen from a distance of 7 miles.

TELOK BLONGAS is about 2 miles deep and one mile wide between Tanjongs Pengampus and Polak, and affords good anchorage. In the inner part are two small bays, Telok Sawar to the westward, and Telok Sepi to the eastward.

The western point of the entrance to Telok Blongas is a long, narrow tongue of land, with high broken summits. About half a cable from the point is a rock awash at low water and always visible on account of breakers. Another rock, awash at low water, lies 3 cables to the eastward, and has depths of 27 to 37 fathoms close-to.

Tanjong Sara (*Lat. 8°54' S., Long. 116°4' E.*), the eastern point of the bay, is the southern extreme of a narrow neck of high land, and, although overgrown, is conspicuous by the red colour of the stone; near the south end the point is 467 feet high. Off the southern end of Tanjong Sara is a rock, 172 feet high, joined to the point by a reef partly above water, and there is a dry rock 3 cables, 236° true, from this. Between Tanjongs Sara and Polak is a small bight with a sandy beach on the northern side.

Gili Sara, a rock 251 feet high, lies in the middle of the entrance of Telok Blongas, and is surrounded by a small reef with 13 fathoms water close alongside.

Telok Sawar, the western bay, is only serviceable for small vessels and praus, and is bordered by reefs. A small reef, with 2 fathoms water over it, lies 2 cables from the southern shore of the bay.

Telok Sepi, to the eastward of Tanjong Batu Gulung, affords anchorage for large vessels, but is only about 3 cables in breadth, and has a general depth of about 9 fathoms. Near the entrance lies Gili Lowang, a small islet about 80 feet high, with 3¼ fathoms between it and the point to the eastward. On the north and east sides of Telok Sepi is a mudbank, and on the southern side a reef.

Directions.—Coming from the westward a vessel may pass either north or south of Sophia Louisa rock; when the west point of Telok

General charts 1654, 941b, 2759a.

Plan of Telok Blongas and Silung Belanak on 2732. Var. 2° 0' E.

Blongas bears 0°, the southern side of Gili Sara should not bear east of 69° true, and when a conical and conspicuous hill, 861 feet high, behind Telok Sawar, is in line with Tanjong Pengampus, a course may be steered in on this mark to the anchorage in the middle of the bay in 16 fathoms.

Telok Pengantap.—To the eastward of Tanjong Sara, is a small bay with a sandy beach, named Telok Pengantap; on the west side of this bay, at a distance of 6 cables, 36° true, from Tanjong Sara, is an islet 177 feet high, and $1\frac{1}{2}$ miles, 51° true, from the same point, lies a flat rock above water.

Silung Belanak is the bay between Tanjong Kaju Belé and a steep point about 4 miles to the south-eastward, the northern part is fronted by a sandy beach and coast reef on which is the conspicuous rock Batu Balinsama. A small islet named Gili Nusa lies in the middle of the entrance to the bay.

Anchorage may be obtained in 20 fathoms, over sand, with Gili Nusa in line with Tanjong Mareseh on the bearing 59° true, but a heavy swell frequently sets in. Small vessels may pass to the northward of Gili Nusa and anchor in the north-east part of the bay in 7 or 8 fathoms.

Chart 1654, Island of Java, eastern portion.

Coast.—Between Silung Belanak and Telok Awang the coast is steep and lined by a reef broken by several creeks with sandy beaches. Gili Batu, a conspicuous rock about 150 feet high, lies on the coast reef at the western entrance point of Telok Gumbang, which has not been examined.

Rock.—At a distance of $1\frac{9}{10}$ miles, 252° true, from Tanjong Tampa, is a rock with a depth of 3 fathoms over it.

Plan of Telok Awang on 2732.

TELOK AWANG is a large bay between Tanjongs Bungkulan and Sangula, and affords good anchorage. There are three villages in the bay; Awang, on the western side, Batu Nampar, on the northern side, and Ekas, on the eastern side. In the north-west and north-east corners are two creeks, but both of them are wholly obstructed by drying reefs; in the centre of the bay is a reef about one mile long in a north-north-easterly direction, and one to 3 cables wide, with a least depth of 7 feet over it. At the head of the bay, on the coast reef, lies the islet Gunong Linus, 197 feet high.

Tanjong Bungkulan (*Lat. 8° 57' S., Long. 116° 23' E.*) is at the western side of the entrance to Telok Awang, and rises perpendicularly

General charts 3706, 1654, 1696, 941b, 2759a.

Plan of Telok Awang on 2732. Var. 2° 0' E.

from the sea, great depths being found near the coast here. At a distance of 7 cables, 245° true, from the point is a rock above water, named Gili Saja.

Tanjong Sangula, at the eastern side of the bay, is bordered by a reef to a distance of 3 cables from the shore.

Water.—There are no rivers in Telok Awang, but drinking water may be obtained from wells at Batu Nampar.

Anchorage.—With the exception of the reef in the middle of the bay there are no dangers, and anchorage may be obtained almost anywhere, the plan and soundings being the best guide. If anchoring in the northern part of Telok Awang the passage to the westward of the above reef is preferable.

Chart 3706, Alas strait.

Coast.—From Tanjong Sangula the coast trends in a general east-north-easterly direction for 8 miles to Tanjong China, and thence in a north-easterly direction for 2½ miles to Tanjong Ringgit, the south-eastern point of Lombok. The whole of this part of the coast rises abruptly from the sea to a plateau 200 feet high; about 4 miles to the eastward of Tanjong Sangula is an inlet, and a coast reef, which projects to a distance of nearly a mile by this inlet, lines the shore for this distance.

The rock Gili Kaliasan lies in the coast reef about one mile to the eastward of Tanjong Sangula, and about 2½ and 3½ miles east of the same point are two very conspicuous, white, perpendicular rocks.

Gili Melayu and Gili Batu.—About 4 miles east of Tanjong Sangula and 3 cables from the coast reef is a rocky islet with a single shrub on it, named Gili Melayu.

Gili Batu (*Lat. 8° 56' S., Long. 116° 30' E.*), a low, dark rock, lies at a distance of 7 cables, 204° true, from Gili Melayu, and to the south-westward of Gili Batu is a rock which dries at low water, and generally marked by breakers; a ridge, with 8 fathoms water over it, extends for a distance of 3 cables to the south-westward of this rock.

Tides.—Springs rise about 7½ feet; neaps one foot.

Tidal streams.—The tidal currents of Lombok strait set close to the westward of Sophia Louisa rock, those of Alas strait are felt close to the eastward of Gili Melayu, between them is always a strong easterly current from the middle of December to the beginning of February. Between Tanjong Pandanan and Sophia Louisa rock the current is particularly strong, and round Tanjong Batu Gendang it is estimated that the current attains a velocity of 5 miles an hour. There are many tide-rips round these points, which a small vessel might find very troublesome.

General charts 3706, 1654, 1696, 941b, 2759a.

Chart 1654, Island of Java, eastern portion. Var. 2° 0' E.

NORTH COAST OF LOMBOK is generally steep-to, and not having been closely examined, must be warily approached. The most noticeable feature from westward is the precipitous Tanjong Beri; all those west of this are sloping.

From Tanjong Sirrah (*Lat. 8°22' S., Long. 116°6' E.*) the coast runs in a north-easterly direction for 6½ miles to Tanjong Papak, and is indented with a few bays of no importance for navigation, as they are inaccessible on account of the reefs already alluded to, page 216.

Beacon.—An iron beacon, with a white cone topmark, is erected near Tanjung, about midway between Tanjongs Sirrah and Papak; the north and south line through this beacon marks the western extreme of the reef off the point.

Anchorage.—About 1½ miles to the southward of Tanjong Papak lies the village of Ketapang, off which good anchorage may be obtained in 10 fathoms water.

A reef, with a depth of 1½ fathoms over it, lies half a mile to the westward of the village.

Coast.—From Tanjong Papak the coast continues in a north-easterly direction for 10 miles to Tanjong Agar Agar, and then turns in an east-by-southerly direction for 23 miles to Tanjong Bondek, the north-easterly point of Lombok. On the north-west coast of Lombok are the villages Luhuk, Sasait, Amor Amor, and Marba, off which anchorage may be obtained.

Plan of Bangsal Barat anchorage on 2732.

Bangsal Barat anchorage is about 4 miles westward of Tanjong Beri, with Mount Rinjani bearing 169° true, and about 3 miles from the shore.

Plan of Labuan Chari anchorage on 2732.

Labuan Chari is 2 miles west of Tanjong Beri; on Tanjong Labuan Chari is a conspicuous clump of cocoanut trees, and the village, which is surrounded by the usual belt of cocoanuts, is a little westward. The anchorage is off a broad open space, west of the village, in about 18 fathoms, hard coral, with Mount Rinjani bearing 169° true. In the western monsoon a heavy surf usually breaks upon the shore, but sometimes in this season there is no difficulty in landing.

Plan of Alas strait, northern entrance, on 3706.

Lawang and Sulat.—The north-east coast of Lombok is fronted by two low wooded islets, Lawang and Sulat, together 5 miles in length. A bank, with a least depth of 17 feet over it, extends for a distance of 7 cables in a north-westerly direction from the north-west point of Lawang. From the south-east point of Sulat a narrow bank,

General charts 3706, 1654, 1696, 941b, 2759a.

Plan of Alas strait, northern entrance, on 3706. Var. 2° 0' E.

with a least depth of $5\frac{1}{2}$ fathoms, extends in a south-easterly direction for 2 miles.

Reef.—A reef, with 17 feet of water over it, lies $1\frac{1}{2}$ miles, 310° true, from the north point of Lawang.

Sungian strait.—The channel between these islets and Lombok is safe, with depths of 11 to 25 fathoms in the northern, and 7 to 15 fathoms in the southern part. The reef that fringes the Lombok shore nowhere extends further than 2 cables off the coast.

Anchorage.—Sungian road (*Lat. $8^\circ 20'S$, Long. $116^\circ 42'E$* .), in the above channel, affords anchorage in 8 to 12 fathoms. Water and firewood can be obtained at Sungian.

EAST COAST OF LOMBOK.—Petagan and Rotsige islets.—Four miles to the southward of Sulat islet, a reef extends $3\frac{1}{2}$ miles in a south-south-west direction, and on it stand Petagan and Rotsige islets, all surrounded by rocky ledges with narrow passages carrying from 4 to 8 fathoms water between them, as charted. The former is nearly a mile in length north and south, and the latter consist of four small islets.

The channel to the westward of the reef is nearly a mile wide at the southern end and about $1\frac{3}{4}$ miles at the northern. It is free from danger, with depths of from 12 to 20 fathoms, and is used by vessels passing through Alas strait from the facility it affords for anchoring in case of light winds.

Surat Castle shoal is a coral patch of 4 fathoms lying three-quarters of a mile 207° true from Tanjong Prepe, the point of Lombok opposite the Rotsige islets. The soundings near are irregular, a 6-fathoms patch lying nearly half a mile to the eastward of the shoal, with 11 and 12 fathoms between it and the Lombok shore.

Atje shoal, in a position 7 cables southward of Surat Castle shoal, is about 2 cables in diameter, with $2\frac{1}{4}$ fathoms least water. Two patches of $5\frac{1}{2}$ and 5 fathoms, respectively, lie about 2 miles off this portion of the Lombok coast; the former is three-quarters of a mile to the southward of the southern Rotsige islet, and the latter is on the northern part of a narrow ledge a mile long, with 6 to 10 fathoms water, running parallel to the coast.

Lombok bay, $3\frac{1}{2}$ miles south-westward of Tanjong Prepe, is a pear-shaped basin about a mile in length, in which large praus find shelter and safe anchorage in both monsoons. The entrance channel, with a depth of only 2 feet at low water, is narrow and winding, with a rapid current.

Anchorage off the bay may be found in 9 to 14 fathoms, sheltered by Lebur, a sandy islet on the north edge of a reef three-

General charts 3706, 1654, 1696, 941b, 2759a.

Plan of Alas strait on 3706. Var. 2° 0' E.

quarters of a mile in length, and about the same distance eastward of the entrance.

The town of Lombok stands on the south and west shores of the bay. A road from the town crosses the island to Ampenan. Water and provisions can be obtained.

Coast.—Vessels can anchor in 8 to 13 fathoms along the coast between Lombok bay and Labuan Haji. The 10-fathoms contour line runs parallel to the coast at an average distance of about a mile.

Segara bay, immediately south of Lombok bay, is an open bay $3\frac{1}{2}$ miles wide between Tanjongs Kajangan and Gali. Anchorage, somewhat sheltered from southerly swell, may be found in the south part of the bay, northward of Tanjong Gali. The bottom is very irregular, and strewn with stones similar to those upon the shore, which, the inhabitants state, were thrown out during an eruption from Tambora volcano. The beach is very steep, and with any swell it is difficult to land.

The village is scattered amongst an extensive grove of cocoanut palms, only one house being visible from seaward; this house bearing 257° true leads to the anchorage, until Tanjong Gali bears 177° true or the little hill at Lombok bay bears 333° true.

Dangers.—A detached reef of $4\frac{1}{2}$ fathoms water lies 2 cables off Tanjong Kajangan.

Two reefs with $2\frac{3}{4}$ and 4 fathoms are situated, 128° true, 6 cables and, 181° true, $1\frac{1}{2}$ miles, respectively, from the same point.

There are several shoals of from $3\frac{1}{2}$ to $5\frac{1}{2}$ fathoms in the southern part of the bay, as charted.

Plan of Labuan Haji road on 3706.

Labuan Haji is 14 miles southward of Lombok bay. The road is not quite safe during the eastern monsoon, as anchors are liable to drag when the sea breeze is very strong. A reef extends along the shore.

The anchorage is outside this reef, in 12 fathoms, black sand, three-quarters of a mile off-shore, with the Custom-house (*Lat.* $8^{\circ}42'S.$, *Long.* $116^{\circ}34'E.$), which has a red roof, bearing 313° true. Vessels ought never to go under 10 or 11 fathoms.

From the anchorage, in the direction of the Custom-house, there is a channel through the reef, suitable for small vessels, marked on the eastern side by two white conical buoys and on the western by two black can buoys. During the south-east monsoon the best time to approach is the early morning before the sea breeze sets in.

General charts 3706, 1654, 1696, 941b, 2759a.

Plan of Labuan Haji road on 3706. Var. 2° 0' E.

Supplies.—Fresh water, firewood, and provisions of all kinds can be obtained at moderate prices. Boats sent to fetch water anchor inside the reef near the mouth of the river; the casks are filled about 100 yards from the beach, and floated off to the boats. The water is good, but should not be taken at high tide, for it is then brackish. During the south-eastern monsoon the surf renders it difficult to get water off.

Communication.—The mail steamer calls fortnightly at Labuan Haji and Pijut bay. There is telephonic communication with Ampenan.

Chart 3706, Alas strait and plans.

Tides.—It is high water, full and change, at Labuan Haji and Pijut bay at XIh. 30m. Springs rise 11 feet, neaps 7½ feet. The flood stream sets to the northward and the ebb to the southward, with a velocity of 1½ to 2 knots at springs. The streams are weaker here than on the Sumbawa side.

Coast.—Between Labuan Haji and Tanjong Luar, a distance of 6 miles, the 10-fathoms contour line approaches to within an average of about half a mile from the shore. The coast is fringed by reefs, except for a space of about a mile, in the vicinity of the Sungai Belajar and the village of Pijut. To the southward of the mouth of Sungai Belajar, and close to the coast, is a conspicuous rock 16 feet high.

Plan of Pijut bay to Tanjong Ringgit on 3706.

Between Tanjongs Luar and Ringgit (*Lat. 8° 52' S., Long. 116° 35' E.*), 6½ miles to the south-eastward, is a deep bay much encumbered by reefs and small islets. In it there are several inlets, forming small harbours, including Lehoks Jukong, Sunuh, and Pulu Tiga, the two latter carrying sufficient water for vessels of any draught.

Pijut bay, the northern part of the above-mentioned large bay, is more frequented than Labuan Haji, being safer and more convenient for watering. The watering place is at the entrance of the Sungai Belajar, 1½ miles north-east of Tanjong Luar. Here vessels can anchor in from 7 to 14 fathoms, hard bottom, about 7½ cables from the shore. The river is navigable for boats.

A reef, nearly dry, extends 2 cables to the southward and eastward of Tanjong Luar, and a 4-fathoms shoal lies 8 cables 128° true from it. The best anchorage is inside this shoal, in 9 to 10 fathoms, with the point bearing 310° true, distant 5 cables.

Three-quarters of a mile southward of Tanjong Luar reef is a large reef of coral and sand, partly dry at low water, with the small islet of Kera on its southern part. Between this reef and the reef extending from the shore is a channel carrying 7 to 8 fathoms water.

General charts 3706, 1654, 1696, 941b, 2759a.

Plan of Pijut bay to Tanjong Ringgit on 3706. Var. 2° 0' E.

Approaching the anchorage, all reefs to the southward will be avoided by keeping northward of the line Tanjong Ringgit in one with the extreme of Tanjong Mangkun, Sumbawa.

Tanjong Ringgit (*Lat. 8° 52' S., Long. 116° 35' E.*).—The peninsula forming the south-east end of Lombok is bounded by small perpendicular cliffs, behind which the land rises to a plateau 220 feet above the sea. Tanjong Ringgit is the eastern extremity of the peninsula, and close off it is a rock, 70 feet high, called Batu Milalang.

Chart 3706, Alas strait and plans.

Two and a quarter miles to the south-westward of Tanjong Ringgit is Tanjong China, with Pilaarrois (Pillar rock), 195 feet high and close to the shore, three-quarters of a mile westward of it.

ALAS STRAIT separates Lombok from Sumbawa, and is about 40 miles long in a north-north-easterly direction. The currents in it are more moderate than in the other straits, and anchorage may be had all along the Lombok shore if necessary. Vessels have passed through Alas strait in one day, while others have been detained four days trying to make the passage through Lombok strait.

Winds.—In the south-east monsoon the wind blows strongly from southward during the greater part of the day, but subsides towards evening, when the land wind from Lombok begins. In the north-west monsoon variable and baffling southerly winds are often experienced in Alas strait. When bound southward it is advisable to get under weigh very early in the morning, in order to clear the strait, if possible, before the sea breeze sets in.

Tidal streams.—The flood runs north, and ebb south, the maximum rate is 2 to 3 knots; it is said at times to reach 5 knots, but this is probably the combined effect of a strong monsoon drift and tidal stream.

SUMBAWA.—Islands off the north-west coast.—Off the north-west coast of Sumbawa are several islands, sometimes known as Timor Yung islands, forming two groups: the north-eastern group, consisting of Kramat, Kamudong, Ajar Tawar, Bungin Kelat, Seringgit, and Panjang, are low, and with the exception of the latter are bordered and united by a steep reef, the 100-fathoms contour line being less than half a mile distant to the northward. Between Seringgit and Panjang is a passage over half a mile in width, with a depth of 27 fathoms towards the Seringgit shore. Panjang, the largest, is 7 miles in length east and west, with an average breadth of about three-quarters of a mile.

General charts 3706, 1654, 1696, 944b, 2759a.

Chart 3706, Alas strait and plans. Var. 2° 0' E.

As these islands are so steep-to on the northern side, caution is necessary when navigating in their vicinity at night.

The channel between these islands and the coast varies in width from one mile between Kramat and Tanjong Perapat at its eastern, to about $4\frac{1}{2}$ miles between the west end of Panjang island and Tanjong Labu Beru at its western end. A mile and a half within its eastern end the channel is somewhat obstructed by the small island Bedil (*Lat. 8° 24' S., Long. 117° 5' E.*), nearly in the centre, on a narrow reef three-quarters of a mile long north-east and south-west, and three patches of a half, $2\frac{3}{4}$, and $2\frac{1}{2}$ fathoms, lying respectively 81° true, 273° true, and 161° true from the islet, the two former being two-thirds of a mile distant and the latter half a mile.

The western end of the channel is partially obstructed by a $2\frac{1}{2}$ -fathoms shoal lying one mile south-west of the west point of Panjang, and two small islets surrounded by reefs, lying north and south $1\frac{3}{4}$ miles eastward of it, to the northward; and by the islands Genang, Ular, Kenawa, Namo, and Kalong to the southward.

With the aid of the chart anchorage may be picked up almost anywhere in the channel, the depths being very irregular (from $4\frac{1}{2}$ to 22 fathoms).

The south-western group of islands, surrounding Tanjong Labu Beru, consists of Kalong, Namo, Kenawa, Ular, Genang (mentioned above), Paserang, and Belang. With the exception of the latter they are all high, with their shores mostly fringed by reefs. Belang, the largest of the group, over 2 miles in length and a mile in width, is low; off its north-east end, and connected to it by a reef, is the remarkable small islet Songi, 230 feet high, and off its south-west end are patches of from 3 to $4\frac{1}{2}$ fathoms, the outer 3-fathoms patch lying 206° true $1\frac{1}{2}$ miles distant from it.

There is no anchorage to the westward of these islands, the reef being steep-to; it is therefore better to keep on the western side in a sailing vessel, to avoid being drifted on Timor Yung islands if the current is setting to the eastward and the wind is light.

Coast.—From Tanjong Perapat, the coast, fringed by reefs, trends in a west-south-westerly direction to Labu Beru promontory, a distance of nearly 19 miles. Two and a half miles south-westward of Tanjong Perapat is Telok Baju, an inlet bordered by reefs affording good shelter for small vessels in 4 to 7 fathoms water. About the same distance further to the westward is a small head of 2 fathoms, two-thirds of a mile from the shore and 136° true, distant $1\frac{1}{2}$ miles from the south point of Ajar Tawar. There is a small dry patch

General charts 1654, 1696, 941b, 2759a.

Chart 3706, Alas strait and plans. Var. 2° 0' E.

between it and the shore. Six miles from Tanjong Perapat is the small island Burung, connected to the shore by a reef; reefs extend a mile westward of its south point, with a depth of 6 fathoms between them and the shore reef.

Bungin bay, south of Seringgit island, is $1\frac{1}{2}$ miles wide between Kaun island to the eastward and an unnamed point to the westward, and about 2 miles deep. The navigable entrance, with a depth of 11 fathoms, is only 2 cables in width between the reefs extending from both shores. The bay is so encumbered by reefs as to be practically useless for any but small vessels, though there are depths of from 3 to 11 fathoms.

Bungin is a small inhabited island on the reef on the west side of the bay. Labuan Alas village lies on the south-east side of the bay.

To the northward and westward of the western entrance point are several shoal heads. The outermost, with a least depth of $1\frac{1}{2}$ fathoms, lies one mile, 351° true, from the point.

Labu Beru bay.—From Bungin bay westward to Labu Beru promontory the coast is fairly clear and steep-to. Labu Beru bay, on the east side of the promontory, affords good anchorage in from 6 to 12 fathoms, sheltered to the northward by the islands Kenawa, Namo, and Kalong. The village of Labu Beru is on the south side of the bay, and here there is a depth of 4 fathoms within a cable of the shore.

Tanjong Labu Beru (*Lat. $8^\circ 31'$ S., Long. $116^\circ 49'$ E.*) is bluff and steep-to; a hill rises immediately within the point to a height of 440 feet.

SUMBAWA.—West coast.—From Tanjong Labu Beru the coast trends in a general southerly direction to Tanjong Mangkun, the south-west extreme of Sumbawa, a distance of 30 miles.

Ten miles southward of Tanjong Labu Beru, and 240° true from Mount Mantar, a sharp unnamed point projects nearly a mile; the coast between is fairly clear and steep-to, with the exception of $2\frac{3}{4}$ and $3\frac{1}{2}$ fathoms patches about half a mile off-shore, situated respectively $5\frac{1}{2}$ and 9 miles from Tanjong Labu Beru.

One and three-quarter miles, 220° true, from the above unnamed point lies Pulo Dua, with a rock above water off its north-east end. A small islet, about a quarter of a mile from the shore, lies 94° true from Pulo Dua. Sasait island, 145 feet high, is situated 4 miles, 191° true, from Pulo Dua; 2 miles to the northward of Tanjong Belusun, which can be recognised by Suikerbrood hill, which rises abruptly to a height of 540 feet, lies Lawang island, 410 feet in height, and connected to the shore by a reef.

General charts 1654, 1696, 941b, 2759a.

Plan of Kertasari and Taliwang bays on 3706. Var. 2° 0' E.

Kertasari bay.—Between Tanjongs Belusun and Biri, $1\frac{1}{2}$ miles apart, is Kertasari bay, which affords anchorage in 6 to 9 fathoms, but not so well protected as Taliwang bay to the southward. Soundings decrease rapidly within the depth of 5 fathoms.

Taliwang (Chereweh) bay affords secure anchorage during the south-east monsoon; it may be easily recognised by its bluff north point, Tanjong Balat (*Lat. 8° 47' S., Long. 116° 47' E.*), and also by Mount Putuh Batu, which rises from the shore to a height of 1,580 feet. A reef extends a cable off Tanjong Balat, and a $4\frac{1}{2}$ -fathoms patch lies $2\frac{1}{2}$ cables south of it, whilst Tanjong Bero, the south point of the bay, is bold and steep-to.

There are two islands in the south-east part of the bay, Puyung (Knoop) island, $5\frac{1}{2}$ cables off Putuh Batu, with foul ground for about $1\frac{1}{2}$ cables off its east side and 15 fathoms between it and the point, and Kenata (Green) island, connected to the shore by a reef.

Two rivers run into the bay, Taliwang, in nearly the centre, and Chereweh, in the south-east part, where also is situated Labuan Lalar village. There is another village, Labuan Balat, at the north end of the bay.

Anchorage.—Vessels in want of wood and water are recommended to anchor in 15 fathoms off Labuan Lalar, about midway between Puyung and Kenata islands: but when provisions only are required they may anchor in 6 to 9 fathoms off Labuan Balat, inside Tanjong Balat. The natives are friendly and ready to assist.

Chart 3706, Alas strait.

Coast.—Between Tanjongs Bero and Mangkun the coast is somewhat indented; Jelengnja, Benéte, Maloh, and Amat being prominent points. This part of the coast is bold and clear of danger, if navigated at a prudent distance. Between Tanjongs Benéte and Maloh is a remarkable inlet, a mile in length and half a mile in width, deep (12 fathoms at its inner end), and clear of danger.

Tanjong Mangkun, forming the south-west extreme of Sumbawa, is a double-table hill 905 feet, bold and steep-to. Lofty hills are visible in the interior, one, 10 miles east-north-east of Tanjong Mangkun, attaining the height of 3,445 feet. The Sumbawa shore has the same character throughout, lofty and broken, furrowed by dark ravines with strange crags and lofty precipices, and covered here and there with woods, especially at the foot of the hills. South coast of Sumbawa, page 242.

Directions for Alas strait.—Approaching from the southward, Alas strait may be recognised by the high rugged land of the south-west part of Sumbawa, and the steep cliffs, which from a distance of 15 miles appear low and flat, of the south-east point of Lom-

General charts 1654, 1696, 941b, 2759a.

Chart 3706, Alas strait and plans. Var. 2° 0' E.

bok. From the northward Mount Rinjani and the high north-west part of Sumbawa are conspicuous. The 100-fathoms contour line from the southward terminates about a mile from Tanjong Ringgit; from the northward it penetrates as far as a line joining Tanjong Gali with the south end of Belang island. The soundings between are deep but irregular. Alas strait, as are all straits eastward of Java, is more or less subject to calms; it is therefore advisable in a sailing vessel to keep within soundings on the Lombok side (as before mentioned), the more so as the currents are not so strong there as in the middle and on the east side.

Chart 1696, Lombok to Flores.

SUMBAWA ISLAND is 145 miles long east and west, but of very irregular shape, being almost cut in two by the deep and wide Saleh bay. The island appears to be very mountainous and almost wholly volcanic, containing many cones, both active and extinct. Of these volcanoes, Tambora (*Lat. 8° 15' S., Long. 117° 59' E.*), which occupies the entire extremity of the northern promontory, is the most remarkable, both by reason of its altitude of 9,630 feet, its gigantic crater 5 miles in diameter, and the memorable outburst of 1815, which destroyed some 12,000 of the inhabitants, and devastated a great part of the island.

Other less important peaks are those of Ngenges, 5,581 feet, over the north-west point of the island, and Sasah, west of Bima bay, 4,635 feet in height.

There are numerous small streams, but owing to the absence of lakes, and the prolonged droughts, which last from five to six months, many of them are not unfrequently dry. The vegetation is closely allied to that of Australia, acacias, euphorbias, and other thorny shrubs being a prevailing feature of the jungle, which as a rule presents a parched and withered-up appearance, very different to that which distinguishes Java and Sumatra. The forest trees comprise teak, sappan, and sandal-wood.

On the low and level tracts of land which border the bays of the northern coast, rice and tobacco are grown, but the want of any system of irrigation keeps cultivation in a backward state; coffee is grown near Bima. Ponies are plentiful, and are considered the best in the archipelago.

The southern coastline has only two bays, that of Chempi, and the better known Waworada; but the northern coast is indented by many bays, two of which, Saleh and Bima, penetrate to within 10 miles of the south coast.

The inhabitants are Malays, allied to the Bugis of Celebes but there are some savage races in the interior, corresponding to the Dyaks of Borneo. The population is unknown, but it has been estimated at

General charts 1654, 1696, 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 10' E.

70,000. The island is divided into four native States, Sumbawa, Dompo, Sangar, and Bima, but the Dutch have an Assistant Resident at Bima, and exercise a general supervision over the governments of the island.

The only towns of any importance are Sumbawa and Bima.

NORTH COAST OF SUMBAWA.—From Tanjong Perapat (*Lat. 8° 22' N., Long. 117° 7' E.*) the coast trends in an east-south-easterly direction for 19 miles to Tanjong Limong, the eastern side of Telok Sumbawa, and then turns to the northward to Tanjong Menangis. The last-named point, which is at the southern side of the entrance to Saleh strait, is the termination of a high peninsula, and at a great distance appears as an island.

The whole length of this coast is very steep-to, the 100-fathoms line being generally about 4 cables from the shore.

Mountains.—Near Telok Sumbawa there is an extensive plain, but to the westward the land is particularly hilly. The most conspicuous mountains are Mount Planen, 2,290 feet high, and Mount Ropang, 4,190 feet, the summit of which is peculiarly sharp.

Anchorage.—Of the numerous bays between Tanjongs Perapat and Limong, the western, Telok Dalam, is of little importance, as there is no convenient anchorage there.

Telok Potu Paddu, about 2 miles to the eastward, affords good anchorage for small vessels. This bay is almost entirely enclosed by high hills and the narrow entrance is not discernible from the sea until a vessel is almost abreast it; the bay is about 4 cables long and three-quarters of a cable wide, and has a greatest depth of $6\frac{1}{2}$ fathoms. The entrance is about 60 yards wide, and it is advisable to keep close to the north-west point in entering; vessels can lie here entirely free from sea or swell. Three miles to the eastward, near Tanjong Ree, a small river discharges; it is only available for flat-bottomed boats, but the water is always good.

Telok Barmang and Telok Lok are 4 and 5 miles to the eastward of Tanjong Ree; the latter bay affords good anchorage in 12 fathoms water.

Plan of Sumbawa bay on 2785.

Telok Sumbawa has no other dangers than the reefs along its shores, which project most from Tanjong Batu Kuping, the west point of the bay, where they extend $2\frac{1}{2}$ cables, steep-to, and dry at low water. The village of Sumbawa is about 4 miles inland. Pilots for Saleh bay can be obtained here.

General charts 1696, 941b, 2759a.

Plan of Sumbawa bay on 2785. Var. 2° 10' E.

Light.—A *red fixed* light is shown in the western part of the bay (*Lat. 8° 28' S., Long. 117° 23' E.*) when vessels are expected.

Communication.—The mail steamer calls at Telok Sumbawa about every four weeks.

Anchorage.—This is in 16 to 20 fathoms, clay bottom, about 4 cables off-shore. Entering from northward, and steering towards the centre of the bay, the soundings decrease regularly but rapidly from 40 to 17 fathoms, and to 7 fathoms within a short distance from a dry sandbank opposite to the mouth of a river, where are some fishermen's huts. As the bay is open a vessel cannot be considered safe during the north-west monsoon. The landing is easiest to the westward of the river on a sandy beach, as the river can only be entered at high water.

Chart 1696, Lombok to Flores.

Maddang, 18 miles to the northward of Telok Sumbawa, is 5 miles long in an east and west direction and three-quarters of a mile broad. The western end is very low, but the northern part is somewhat higher, and can be seen from the deck at a distance of 16 miles in clear weather. The entire island is surrounded by a drying reef, which in some places on the south side extends for more than half a mile. There are two villages in the eastern part of the south side, Mandar and Bajau.

A good lookout must be kept when in the vicinity of the island at night, as vessels have nearly run on shore before seeing it.

Anchorage.—The south-east shore forms a small bight, opposite to which a vessel can anchor in 30 fathoms, one mile off-shore. There is also anchorage in 20 fathoms, north-eastward of the east point.

Dangers.—At a distance of 7 cables from the north point of Maddang is a depth of $2\frac{1}{2}$ fathoms, at 4 cables from the west point, a depth of 2 fathoms, and at a mile, a depth of $4\frac{1}{2}$ fathoms.

Moyo island, lying across the entrance to Saleh bay, and 5 miles south-east of Maddang, is 17 miles in length in a north-east direction, and 1,785 feet high. It is hilly, with the exception of the east point, which appears at some distance as a low and separate island. The south point of Moyo is moderately bold. A reef projects from the west and north sides, in some places more than half a mile; and the bay on the west side of the island is full of shoals.

Anchorage.—Almost everywhere the coast of Moyo is very precipitous and the depths increase rapidly near the shore; the only places where a vessel can anchor within the 10-fathoms line are one mile east of Tanjong Sabaru and one mile west of Tanjong Panda. In the latter is a $4\frac{1}{2}$ -fathom patch.

General charts 1696, 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 10' E.

Saleh strait, south of Moyo, is 3 miles wide at the western entrance, and $1\frac{1}{2}$ at the eastern, and is a clear channel steep-to on the northern side. About one mile west of the village Penjaringan good anchorage may be found; in this bight there is shoal water. It is preferable for vessels to keep to the northern side of the strait, which is entirely free from danger.

The tidal streams set with great velocity through this strait, and probably also through Batahai strait on the eastern side of Moyo.

Batahai strait, the channel eastward of Moyo, is about $1\frac{1}{2}$ miles wide, with deep water, but a reef, with $5\frac{1}{2}$ fathoms least water over it, lies 6 cables from Tanjong Brenti (*Lat. 8° 9' S., Long. 177° 44' E.*) on the north-eastern side of the strait.

SALEH BAY.—This large bay, which extends in an east-south-easterly direction for about 45 miles, has an average width of 10 miles. The southern side is very irregular and hilly, with numerous smaller bays and islands, most of which are uninhabited; this part of the coast is difficult to approach as there are a great many rocks and shoals. The northern part of the bay, which ascends gradually to Tambora volcano, is steep-to, the 100-fathoms line running close along the coast as far as Tanjong Paranggawau and then westward of Tanjong Ngali.

Tides.—Tidal streams.—In Praja bay, on the southern side of Saleh bay, it is high water, full and change, at 0h. 0m.; springs rise from 3 to 4 feet.

Tidal streams are almost unnoticeable in Saleh bay except at the entrance, where they sometimes attain a velocity of 2 miles per hour.

South shore of Saleh bay.—Praja bay, the western bay on the southern side of Saleh bay, is half a mile in breadth and runs to the southward for a distance of about 4 miles; the depth at the entrance is 28 fathoms, decreasing gradually to the southern extreme. The shore is low and thickly overgrown, and is surrounded by a small coast reef. In the south part of the bay, near the eastern shore, are two shoals of 14 and 15 feet water, and one of 3 feet in the middle of the south part, otherwise the whole of this part affords excellent anchorage for either large or small vessels.

Tarata bay.—The entrance to this bay lies between the islands Liang Maja and Dangar besar on the westward, and Ngali on the eastward side, and there are a great number of smaller islands in the bay.

Kuries, the principal village, lies in the south-west extreme of the bay, about half a mile inland, on the banks of a fine river, and is

General charts 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 10' E.

clearly seen from outside the bay. Anchorage may be obtained near the mouth of the river in 9 fathoms. To the eastward of Kuries the bay is shallow and foul.

Directions.—The channel to the anchorage off Kuries village is between Liang Maja and Ngali, passing to the westward of the small island Kabo in the southern part of the bay, and keeping close to the south-east and south points of Liang Maja, steer for the mouth of the river.

Islands and reefs in Tarata bay.—Dangar besar, 405 feet high in the northern part, is about $1\frac{1}{2}$ miles long and three-quarters of a mile broad; from the east and west sides a coast reef extends, that on the east side to nearly 4 cables. Westward of this island lies Dangar kechil, with depths of 6 to 7 fathoms in the channel between, and about a mile off the north-west point of Dangar besar is a sand-bank.

In the shoal water west of Dangar besar is the best anchorage in this part of Saleh bay.

Liang Maja is a hilly, uninhabited island, 4 miles long in a north and south direction, and 2 miles broad, and, except for the south side, is surrounded by a broad coast reef. Off the north-east point is a small island and several shoals.

Ngali, 6 miles long in a north-west and south-east direction and 2 miles broad, is also hilly and uninhabited, and is surrounded by a coast reef. Shoals extend off the north-west point for a distance of 6 cables. Entering Tarata bay from the eastward, Kabo island should not bear to the westward of 180° true when passing this point. Off the north-eastern side of Ngali are two small islets.

Kabo is a high, sharp pointed islet.

Tengar, Katapang, Dampo, Ganteng, and Taikabo.

—These islands extend in a south-easterly direction in front of Kullong bay, to the southward of Ngali island.

Tengar is a hilly island, joined to Ngali by a drying reef; Katapang is low and surrounded by a coast reef. There is a clear, deep channel between these two islands.

Dampo is high and very conspicuous, with a saddle-shaped ridge 830 feet high at its highest part; it is separated from Ganteng by a shallow channel greatly obstructed by a drying rock and shoal.

Taikabo (*Lat. $8^\circ 37'$ S., Long. $117^\circ 52'$ E.*) is hilly and overgrown; nearly one mile to the southward is a small shoal with 10 feet water over it.

Aart van Nes, which dries, and is about 3 cables in extent, lies

General charts 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 10' E.

close to the 100-fathoms line at a distance of $3\frac{1}{2}$ miles, 41° true, from the summit of Dampo island.

At a distance of $2\frac{1}{2}$ miles, 98° true, from Aart van Nes is a rock with a depth of one foot over it; 2 miles further to the eastward is a bank which dries.

Coast.—South of Ngali island the coast runs to the southward for $2\frac{1}{2}$ miles, and then to the eastward to Tanjong Dewa, forming a small bay named Telok Taru, in which there are several shoals. Sanggoro village is situated in this bay. Midway between Tanjong Dewa and Ganteng island are a drying bank and a shoal with 2 feet water over it.

Southward of Tanjong Dewa the coast trends in a southerly direction to the village Ujung, and then in an easterly direction to Tanjong Bajak (*Lat. $8^\circ 42'$ S., Long. $117^\circ 54'$ E.*). In the bay thus formed are the islets Paning, Lipan, Baloso, and Santigi, besides many shoals and drying banks, too numerous to describe. With a good look-out and careful attention to the lead it is practicable to reach the village Ujung.

Telok Santong, between Tanjongs Bajak and Kasambi, affords good anchorage. At the entrance to this bay are two shoals, with depths of 17 feet over them, at a distance of 7 cables, 30° true, and $1\frac{1}{2}$ miles, 21° true, from Tanjong Bajak.

Between Tanjongs Kasambi and Tarujung is a small bay fringed with a broad coast-reef; $1\frac{1}{2}$ miles to the westward of Tanjong Tarujung is a shoal with 8 feet of water over it.

Rakiet is a hilly island of irregular shape, forming several bays on the north and west sides; the eastern side is fronted by a reef which is very broad in parts. There are several shoals on the western side within the 10-fathoms line.

Shoal.—A shoal, about one cable in diameter, awash at low water, lies 2 miles to the northward of Rakiet.

Coast.—From Tanjong Mamba the coast trends eastward for $8\frac{1}{2}$ miles to Tanjong Pekat, and forms many small bays, none of which are of any importance. From Tanjong Pekat it bends to the southward, forming Telok Bangko Lua, which is bounded on the eastern side by several islands named Panihi, Besar, Wakakos, Kawangko, and Balere.

Telok Bangko Lua affords good anchorage, and excellent water may be obtained.

Shoals.—To the north-eastward of Tanjong Mamba, and about 2 miles from the shore are three large, and one small, drying banks. Further north, and about 7 miles from the shore, is a drying bank about 3 cables in diameter.

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Chart 1696, Lombok to Flores. Var. 2° 10' E.

Coast.—Eastward of Bangko Lua are the small Teloks Larak and Napa; the small island Maja lies to westward of the entrance to Telok Larak, in the neighbourhood of which good anchorage may be found.

From Telok Napa the coast trends to the northward and then curves round to the westward to Tanjong Kesi (*Lat. 8° 34' S., Long. 118° 12' E.*). A reef extends from all this part of the coast, but it is otherwise free from danger except for a small patch of 3 fathoms at a distance of 12 cables, 6° true, from Napa islet, in the eastern part of Telok Napa, and some drying rocks in Telok Kempang, to the eastward of Tanjong Kesi.

Mount Rumah.—In this last part of Saleh bay is the very conspicuous Mount Rumah. This hill, 840 feet high, is the southern extreme of a ridge which, at a distance, gives one the impression of the roof of a house.

Sapudu, 1½ miles southward of Tanjong Kesi, is a rock covered with undergrowth, and surrounded by a broad drying reef with two or three rocks above water on it.

North shore of Saleh bay.—Tanjong Paranggawau is 7 miles to the north-westward of Tanjong Kesi. Between these points good anchorage may be found in 15 fathoms, but further westward the coast is precipitous, the 100-fathoms line running close along it. It is entirely free from danger except for a small reef at a distance of 2½ miles, 293° true, from Tanjong Nchanga.

Satonda island, 4½ miles to the north-eastward of Moyo, is a densely overgrown islet about 1½ miles in diameter; the highest part is 1,024 feet. In the centre of the island is a large salt-water lake, probably an old volcanic crater. The reefs round it are of very small extent, the 100-fathoms line running close to the shore. View at page 238.

COAST.—From the entrance of Batahai strait north-east and east to Tanjong Katupa, the usual fringing reef appears to be absent, with depths of 10 to 17 fathoms a cable or more from shore; shoal water extends about half a mile off-shore 4 miles westward of Tanjong Pakijongan. This coast can seldom be approached in the westerly monsoon.

Plan of Nanga Miru bay on 2785.

Nanga Miru bay, south from the west end of Satonda island, has depths of 35 fathoms, 2½ cables from shore, with anchorage in 18 fathoms in the south-west corner, one cable off, north-westward of a small river.

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Chart 1696, Lombok to Flores. Var. 2° 10' E.

In Penakan bay, 8 miles north-east of Nanga Miru, with the centre of Tambora bearing 145° true, anchorage has also been found; a fine stream of fresh water was observed at the head of this bay.

Plan of Sanggar bay on 2785.

Sanggar or Dampo bay, 20 miles wide between Tanjongs Katupa and Juli, and 10 miles deep, is separated from Saleh bay by the peninsula on which stands Tambora volcano. There are three anchorages, Telok Moti Toi on the western side, Kambu road at the head, and Telok Kilo on the east side, all safe in the south-east monsoon.

Extending for 1½ miles in a north-westerly and south-easterly direction across Telok Moti Toi is a ridge with a least depth of 5 feet in the western part and 2 fathoms in the eastern part. On either extreme is a clear deep channel, and there is good anchorage inside the ridge in 14 to 16 fathoms.

In Kambu road the depth is 20 fathoms 2 or 3 cables from shore; the best anchorage is off Sungi Kambu in 16 fathoms water. On the western side is the islet Radeh joined to the coast by a drying reef, to the northward of Radeh is a large drying reef and to the eastward a small patch of 2½ fathoms, and generally foul and rocky ground westward of the anchorage. A reef projects northward 2 cables from Tanjong Matompo.

Telok Kilo has narrow anchorage in 15 fathoms. In the southern part of this bight, at a distance of 1½ miles, 197° true, from Tanjong Propa, is a depth of 2¾ fathoms.

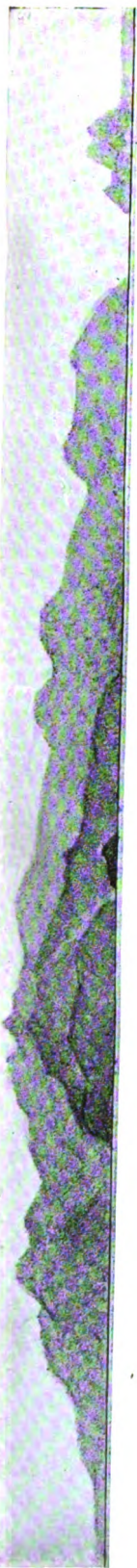
Plan of Bima bay on 2785.

BIMA BAY, 15 miles east of Tanjong Juli, runs nearly south for 14 miles; there is secure and landlocked anchorage in 18 to 15 fathoms, sand and mud, over a large area of the inner part. In two places, 3 and 5 miles within the entrance point, Batu Putih, the channel narrows to less than a quarter of a mile between the shore reefs with deep water, then widens to 2 miles, nearly to the head. The muddy flat opposite the town of Bima (*Lat. 8° 27' S., Long. 118° 43' E.*), on the east side, dries off three-quarters of a mile, and reduces the width of the passage east of Kambing island to half a mile. A boat channel, with entrance marked by a pole and basket on each side, has been dredged to the edge of this mud-flat, and landing in light boats can be effected at any time except within 1½ hours of low water spring tides. The creek, 2 miles long, in the south-west corner, dries at low water.

During the south-east monsoon very strong southerly winds, accompanied by heavy squalls, blow sometimes continuously for many days,

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Mt. Tambora.



Sumbawa, north coast.

Satonda, bearing 236° true, 11 m.

Summit, 182° true, 12 m.



Banta.

Sapeh strait, north entrance.

Sumbawa.



W. point, bearing 2° true, 17 m.

Kelapa.

Islands in Sapeh strait, from the southward.

Banta.



Langkoi island, bearing 346° true, 15 m.

Komodo.

Linta strait, from the southward.

Linta strait.

Plan of Bima bay on 2785. Var. 2° 10' E.

making it impossible for sailing vessels to enter the bay, though within the channel it is quite calm under the high land. The land breezes blow regularly during both monsoons, and there is therefore no difficulty in quitting. When southerly winds prevent entering it is advisable to anchor on the east side of the outer bay, as otherwise a vessel is obliged to stand off during the night, and many days may be lost in a fruitless attempt to work in.

Anchorage.—There is anchorage outside in 7 fathoms, near the western shore, with Mount Soromandi bearing 290° true. Anchorage outside, however, is not safe during the north-west monsoon, nor during a fresh sea breeze; but they are proper places to wait an opportunity of entering the narrows.

Off Bima ships usually anchor between Kambing island and the mouth of Sungai Romo, in 9 or 10 fathoms.

Bima is a free port, and the residence of both the Sultan of Bima and the Dutch officer, who is under the Resident of Celebes. The town is built on a flat, which during the north-west monsoon becomes a swamp, and fever, generally of a severe type, is prevalent, more especially on the advent of the rains. The population is about 10,000.

Tides.—It is high water, in Bima bay, at full and change, at noon; springs rise 6 feet. The tidal streams appear to be weak.

Supplies.—Chickens, fish, vegetables, and fruit are plentiful. Water is brought from a spring in the hills some 5 miles distant.

Communication.—There is mail communication every four weeks, with Surabaya, Batavia, and Makassar

Chart 1696, Lombok to Flores.

Sangeang island, off the north-east point of Sumbawa, is a high volcanic island rising in two peaks; the northern and higher being 6,335 feet high, the southern 5,890 feet. In September, 1907, there were three active craters visible. The island is steep except on the north and north-east sides, where two reefs advance to a short distance. It is inhabited, and fresh water may be obtained from a stream near a scattered village on the north-west side.

EAST COAST OF SUMBAWA.—**Tanjong Naru** (*Lat. 8° 19' S., Long. 119° 1' E.*).—The whole of the north-east point of Sumbawa is low and flat, uninhabited, but densely covered with trees and shrubs. A drying reef extends eastward from this point to a distance of 3 cables.

Coast.—From Tanjong Naru the coast turns sharply to the southward and forms a small bight between this point and Toro Tingeh which affords anchorage, but the ground-swell and current make it

General charts 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 10' E.

uneasy. The 10 and 20-fathoms line lie at a considerable distance from the coast.

Shoal.—At a distance of $1\frac{8}{10}$ miles, 330° true, from Toro Tingeh, is a shoal 8 cables long in a north and south direction and 3 cables broad, with $3\frac{3}{4}$ fathoms water over it. To the eastward of this is a depth of 7 fathoms.

Anchorage.—The small bay northward of Toro Tingeh affords good anchorage in 6 to 7 fathoms, over sand, entirely free from ground-swell. Toro Tingeh is about 100 feet high, and very conspicuous.

Coast.—From Toro Tingeh the land is again mountainous, and the coast is divided into small bays and high, rocky points. Mount Maria is the highest and most conspicuous in this part; it has a very blunt summit, 4,855 feet high, which is generally concealed by clouds.

Batu Kapal, about one mile to the northward of Toro Lando, is a rocky islet 70 feet high. In the small bay to the southward a vessel will find good anchorage.

From Toro Lando the coast trends to the southward for 5 miles to Tanjong Wamba (*Lat. 8° 31' S., Long. 119° 3' E.*) with two bays, Labuan Cheri and Labuan Kowo, which afford good anchorage. The small islet Kamara lies on the coast reef off Tanjong Wamba.

Reef.—About one mile to the northward of Tanjong Wamba is a reef, about 4 cables in diameter, with 5 feet of water over it. On the north-western side of this reef is (1904) a wreck showing above water.

Plan of Tanjong Wamba to Toro Rano on 895.

Toro Naga Nuri.—To the southward of Tanjong Wamba the land is mostly low and flat; Toro Naga Nuri, 261 feet high, is the termination of a ridge running through this plain. The bay between these points is of little importance, and there are many shoals in it. A $4\frac{1}{4}$ -fathom patch lies $1\frac{1}{3}$ cables eastward of Toro Naga Nuri.

Sapeh bay is formed by a deep bight in the Sumbawa coast, and is sheltered by Nisa Sanai, and islands adjacent; the entrance is nearly one mile wide, with soundings of 17 fathoms. The Sumbawa shore is lined by a reef extending half a mile off in places; but the islands may be approached within a short distance. The southern entrance is completely blocked by reefs, which extend westward to Nisa Tosso.

Sapeh town is situated up a creek at the south-west extremity of the bay; ships may procure there every kind of refreshment by barter. Water is good and is obtained without difficulty.

Vessels can anchor in 13 fathoms, south of Toro Naga Nuri, with Nisa Tosso bearing 146° true, distant 3 cables.

General charts 1696, 941b, 2759a.

Plan of Tanjong Wamba to Toro Rano on 895. Var. 2° 10' E.

Tides.—It is high water, full and change, at 1h. 0m.; springs rise 10 feet.

Coast.—To the southward of Sapeh bay is an unnamed bay which affords good anchorage. From the southern side of this bay a drying bank extends about 4 cables from the shore, and there are also a number of rocks above water. The western side is foul, and there are several rocky islets near the shore. On the eastern side is another small bay named Loh Latoh, but the middle part of it is obstructed by reefs.

Inland is a long chain of mountains running from west to east, and terminating eastward in two high peaks, close together, named Mount Lambu.

Reef.—At the entrance to the bay, almost mid-way between Nisa Sanai and Toro Gaduh, is a reef with a depth of $5\frac{1}{2}$ fathoms over it. South-westward of Toro Gaduh is a drying reef.

Toro Mabalang (*Lat. 8° 33' S., Long. 119° 10' E.*).—From Toro Gaduh the coast trends in a north-easterly direction to Toro Mabalang, with several small bays between, in one of which is the small islet Nisa Dokoh.

Sentodo island lies to the north-eastward of this point, and is 197 feet high. Westward of Sentodo is a small islet, and to the eastward two rocks, 20 feet high.

Coast.—From Toro Mabalang the coast turns to the southward to Tanjong Rata, the south-east point of Sumbawa, and forms several unimportant bays, the principal being Labuan Jati and Labuan Botu.

Mata Gateh (Kamara) island lies across the entrance to the former. A 2-fathoms shoal lies 6 cables southward of it.

Kelapa island, 463 feet high, is 5 miles to the south-south-eastward of Mata Gateh. In most parts it is surrounded by a coast reef which, on the eastern side, extends for a distance of 8 cables with several pinnacle rocks on it.

South-south-westward from Kelapa island are two rocky islets named Ilus; the northern is 128 feet high and the southern 98 feet.

LIGHTS.—A *white flashing light every five seconds*, thus:—flash, *one second*; eclipse, *four seconds*, is exhibited, at 512 feet above high water, from a lighthouse on the summit of Kelapa, and should be seen from a distance of 30 miles. The lighthouse is a white skeleton tower, 49 feet high.

A *white fixed light* is exhibited, at 446 feet above high water, from a lighthouse situated 794 yards, 352° true, from the preceding lighthouse, and should be seen from a distance of 28 miles, when bearing between 167° and 177° true. The lighthouse is a white skeleton tower, 13 feet high.

These lights in line, 172° true, lead through the channel between Mata Gateh and Barsu Panda.

General charts 1696, 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 0' E.

SOUTH COAST OF SUMBAWA.—The south coast of Sumbawa is very mountainous, and densely overgrown almost everywhere. There are two important bays, Waworada and Chempi; isolated inhabitants are found here, but otherwise the coast is uninhabited. There are a few small rivers, but they are shallow.

Coast.—From Tanjong Mangkun, the south-west point of Sumbawa, page 230, the coast runs in an east-south-easterly direction for 18½ miles to Tanjong Talonan. During east and west monsoons there is always a heavy swell from the south-westward, which breaks heavily on the coast reef.

Tanjong Tatar, 11 miles to the eastward of Tanjong Mangkun, is steep, and close to the shore is a rock awash at low water. Between this and Tanjong Talonan the coast forms a wide bight, known as Telok Tatar. Mount Tatar, which rises abruptly from the point, has two summits close to each other, the western summit being 1,515 feet high, and the eastern, 1,710 feet. Mount Sekongkang, to the eastward is 2,480 feet high, but is not very readily distinguished from the surrounding high land.

To the eastward of Tanjong Talonan is the small bay Telok Talonan, with a rivulet at its head.

From Tanjong Talonan the coast trends in an east-by-north direction to Tanjong Gerantah, and then turns to the northward. Tanjong Gerantah can be recognised from the westward by a small rock close to the coast, which can be seen from a distance of 5½ miles.

Telok Lampui, to the eastward of Tanjong Gerantah, affords anchorage in the west monsoon, in 30 fathoms, over sand, close to the shore. At the head of the bay is a sandy beach, with a few streams. The small bay, Telok Lamar, is on the western side, and on the eastern Telok Lampit, into which the small river of that name runs.

Telok Panas affords good anchorage in about 15 fathoms of water, near the mouth of Sungai Panas (*Lat. 8° 57' S., Long. 117° 40' E.*). The coast in this part is low, and well wooded.

Mountains.—Mount Sebu, 3,310 feet, and Mount Liang, 3,060 feet high, to the northward of Tanjong Dodo, are visible from the sea, but the mountains further inland are seen with difficulty. Mount Dodo, 3,385 feet, is 5 miles northward of Sebu, and to the westward are Mounts Ginaleh and Utok, 2,660 and 3,340 feet high, respectively.

Telok Baru, to the eastward of Tanjong Mata, affords anchorage in 20 fathoms, over sand, in the north-eastern part; the anchorage can be recognised by some cocoanut trees standing on the coast. At the head of the bay is a rock which dries at low water, detached from the coast reef.

Plan of Chempi bay on 2785.

Chempi bay, between Tanjong Baru and Toro Doro, runs inland in a north-north-easterly direction for nearly 20 miles, and is enclosed

General charts 1696, 941b, 2759a.

Plan of Chempi bay on 2785. Var. 2° 10' E.

by high mountain land. Doro Riwo, one mile from the western shore of the bay, is 2,205 feet high; on the eastern side of the bay are Doro Lodo, with three summits, the southern and highest being 3,740 feet high; and Doro Rumu, a conspicuous hill, 851 feet high, with a tree on its summit. A number of small rivers flow into the bay, the most important being the Sungi Dampo at the head of the bay, and the Sungi Hu-u on the eastern side.

On the western side of the bay are two inlets, Telok Puri and Telok Somila, separated by Toro Sahe, a conspicuous point with red cliffs. Telok Puri is entirely obstructed by a drying reef; 2 miles to the south-westward, and on the coast reef, is Begruide rock, 113 feet high. Telok Somila has a sandy beach in the northern part.

Opposite Telok Puri, on the eastern side of the bay, is a large reef which extends half-way across the bay, named Batu Kurung Buha.

At the head of Chempi bay is the islet Sura (*Lat. 8° 40' S., Long. 118° 28' E.*), 266 feet high.

Anchorage.—On the western side of Chempi bay, anchorage may be obtained anywhere; the best anchorage on the eastern side is to the northward of Batu Kurung Buha. The landing place is in the small bay north of Toro Hu-u, but inside the 3-fathoms line it is considerably obstructed by rocks.

Sura islet in line with the northern summit of Doro Lodo, 53° true, leads into Chempi bay, but when abreast of the south point of Telok Puri it is advisable to be to the eastward of this line, as there is a shoal of 5½ fathoms off the point.

Chart 1696, Lombok to Flores.

Coast.—From Toro Doro the coast runs in an east-by-northerly direction for 30 miles to Toro Langudu, forming a bight, in the middle of which is Doro Rasa, 1,415 feet high, and rising steeply from the sea.

Telok Mua, between Toro Mua and Toro Taä, affords somewhat better anchorage than is to be found elsewhere on this part of the coast. Toro Taä has a summit, 285 feet high, near the southern extreme.

Nisa Sido, an islet on the coast reef, 1½ miles to the south-westward of Toro Langudu, has two summits, the higher being 190 feet.

Toro Langudu is a steep, conspicuous point. Two rocks, awash at low water, lie 2 cables to the eastward of the point.

Plan of Waworada bay on 2785.

WAWORADA BAY, nearly 3 miles wide at the entrance between Toro Sido and Toro Jampang, runs inland in a north-westerly direction for about 3 miles, and then to the westward for 13 miles. A mountain range extends over the peninsula, forming the southern boundary of the bay, the highest summit being Doro Pusuh, 2,171 feet high. Doro Simposai, 1,363 feet high, at the western end of the bay,

General charts 1696, 941b, 2759a.

Plan of Waworada bay on 2785. Var. 2° 10' E.

is very conspicuous. The rivers that run into the bay are of little importance as most of them are dry during the east monsoon; the inhabitants mostly obtain their water from wells. There are several villages on the north side, the principal being Kerumbu, Rupeh, and Koro Jangan, and a few temporary habitations on the south side. The people are under the government of the Sultan of Bima, and cultivate rice in large quantities.

South side.—From Toro Sido to Toro Pangkajarat the coast runs in a north-westerly direction, forming two inlets, Telok Sido and Telok Pangkajarat. Toro Pangkajarat rises to a hill 679 feet high about half a mile from the shore.

From Toro Pangkajarat the coast trends to the westward to the head of the bay, the western part being flat and marshy with a drying coast reef.

Nisa Dua lies on the coast reef about midway on the southern side of Waworada bay, and Nisa Kekah, a rock 10 feet high, lies close to the eastward of it.

Near the head of the bay is Telok Sera Runtuh, a small creek almost entirely obstructed by a drying reef.

Telok Langau, the creek at the head of the bay, is almost filled in by a drying bank of mud.

North side.—Between Toro Jampang and Toro Chengeh is Telok Tangah, in which the depths are regular; it is free from dangers. From Toro Chengeh the coast runs in a south-westerly direction to Toro Runchuh and then forms a large bight to the head of the bay, with several small islands in between, the principal of which are Nisa Bea, Nisa Dorah, Nisa Sura, and Nisa Tanah; the latter lies on the coast reef to the southward of Toro Waworada (*Lat. 8° 42' S., Long. 118° 47' E.*).

Reef.—At a distance of $1\frac{1}{10}$ miles, 184° true, from Toro Waworada, is a reef with 3 feet water over it and marked by discoloured water.

Anchorage can be found anywhere in the bay. The northern extreme of Nisa Dorah in line with the southern extreme of Nisa Bea, 277° true, is a good mark for running into the bay; in clear weather Doro Simposai will be seen ahead on this bearing.

Tides.—In Waworada bay the tide is almost purely double daily. The double-daily tide has springs 2 days after full and change, with high water at XIh. 30m., and an average rise of 9 feet; neaps occur at the same interval after the quarters with high water at Vh. 30m., and an average rise of 2 feet. About the second half of March and September springs rise to a maximum of 13 feet, and in the second half of June and December to a minimum of 5 feet. In the second half of

General charts 1696, 941b, 2759a.

Plan of Waworada bay on 2785. Var. 2° 10' E.

June and December neaps rise 6 feet, and in the second half of March and September 2 feet.

The single-daily tide gives high water at 1st January at VIh. 30m. p.m.; 1st April at 0h. 30m. p.m.; 1st July at VIh. 30m. a.m.; and 1st October at 0h. 30m. a.m.; springs are on the day of the greatest half-monthly declination of the moon with an average rise of 3 feet; neaps on the day when the moon's declination is 0°, with an average rise of 6 inches.

During the months of June and December these ranges increase to 3½ feet and one foot, respectively; during March and September springs decrease to one foot, neaps are imperceptible.

The high water of the spring tides of both groups cannot fall together. The highest water is reached about the middle of April at XIh. 30m. a.m.; or the middle of October at XIh. 30m. p.m.

Chart 1696, Lombok to Flores.

Coast.—From Toro Jampang the coast trends in an easterly direction for 9½ miles to Tanjong Rata (*Lat. 8°45'S., Long. 119°8'E.*), the south-eastern point of Sumbawa, page 241. To the westward of Tanjong Rata is a small bay which affords anchorage; a rock awash at low water lies in the middle of the entrance.

SAPEH STRAIT, between Sumbawa and Komodo islands, is considered less safe than Alas strait, which is generally preferred to it, especially in the north-west monsoon. The tidal streams are rapid in the narrow part, which is separated into several channels by rocky islets. The northern portion is divided into two branches by Banta island, but the channel between Banta and Komodo is seldom used, as it is to leeward during the north-west monsoon, and has no soundings, while the ebb stream sets strongly on Komodo island, which is high, steep-to, and bordered with reefs. Between Banta and Sangeang island the channel is clear. Views at page 238.

Tidal streams.—Although the streams set rapidly through the middle of the strait, the flood to the northward and the ebb to the southward, they become much weaker within the edge of the bank of soundings on the north-east side of Sumbawa, especially in the bays. It is probable that both flood and ebb streams overrun the times of high and low water by the shore, but how much is unknown, and information on the set of the streams is much needed.

The winds are variable in Sapeh strait, and take the form of land and sea breezes; those from the westward prevailing during the north-west monsoon. In the opposite season strong breezes blow into the strait from the southward a great part of the day.

General charts 1696, 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 10' E.

Soundings.—The outer limit of the bank of soundings stretches nearly in a direct line from the north extreme of Banta to Toro Maru; the soundings decreasing pretty regularly towards Sumbawa, from 60 to 20 fathoms, which depth will be found from half to a quarter of a mile off-shore; but towards Banta island the water is very deep, and in the southern part of the strait beyond half a cable's length south of Sapekah. The bottom hereabouts is all rocky, with overfalls and rapid tides setting past Sapekah at the rate of 4 and 5 knots, and producing strong rippings like breakers, which render ships ungovernable.

Islands and reefs in Sapeh strait.—Banta island is about 4 miles in diameter, uninhabited, and 1,314 feet high. The southern point is low, and bordered by reefs; and there is a rock with 3 fathoms, and deep water around, $1\frac{1}{2}$ miles south-east of the island.

Anchorage.—Labuan Gili Banta, the bay on the south side of Banta, affords anchorage for large ships to northward of the small islet on the eastern side of the entrance; the 10-fathoms line runs about 3 cables from the shore. The depths in the bay decrease from 30 fathoms at the entrance to 4 fathoms at the head.

Barsu Basso, a few feet above the surface, lie about 2 miles, 238° true, from the south point of Banta island. They extend south-eastward for about 2 miles, and are easily seen by the heavy breakers over them.

Plan of Tanjong Wamba to Toro Rano on 895.

Barsu Menjerih, $1\frac{7}{10}$ miles to the southward of Barsu Basso, is a small pinnacle rock awash at low water. Owing to the fact that breakers are seldom seen here, it is a serious danger in the strait.

Barsu Panda (*Lat. 8° 32' S., Long. 119° 14' E.*) is 34 feet high and of a dark colour; from the northern side a ridge with 17 feet of water over it, extends for a distance of 3 cables. On the southern side is a depth of 6 fathoms.

Tukoh Mapinka is in reality two separate islets, the higher being 49 feet high, separated by a narrow channel and situated about a mile to the south-eastward of Barsu Panda. They are steep-to, and a vessel may pass close to.

Sapekah, about $1\frac{1}{2}$ miles to the eastward of Tukoh Mapinka, is 246 feet high, and steep-to on the southern side; on the northern side it slopes gradually down. On the north-western side is a rock, 20 feet high, joined to the island by a drying reef.

General charts 1696, 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 10' E.

Tukoh Gili Banta (Piek islet) lies to the south-eastward of Banta, almost midway between that island and Komodo. It is 197 feet high, and very steep-to.

At a distance of one mile, 336° true, from Gili Banta is a small rock generally just above water.

Luluh Tare, $1\frac{7}{10}$ miles, 132° true, from Gili Banta, is a needle-shaped rock 69 feet high, and is surrounded by a small reef.

Nisa Léme lies south-eastward from Sapekah and 2 miles from the west coast of Komodo. It is 135 feet high, and very much like Gili Banta in appearance; a vessel may pass close by it without danger.

West coast of Komodo.—Komodo, on the east side of Sapeh strait, is almost uninhabited except for hunters who come for deer, which are very plentiful. The island is mountainous, but has no conspicuous summits on the western side, and this side of the coast has few bays of any importance.

Chart 3756, Linta and Molo straits.

Lehok Boko or Pamali bay, 2 miles to the southward of Toro Batu Moncho (*Lat. 8° 26' S., Long. 119° 26' E.*), the north-west point of Komodo, affords anchorage in 10 to 14 fathoms, about $1\frac{1}{2}$ cables from the south shore. In the southern part of the bay, about 3 cables from the shore, is a large reef with 17 feet over it.

Chart 1696, Lombok to Flores.

Lehok Boi and Laju Pamale bay.—A high tongue of land separates Lehok Boko from the large bay to the southward. The latter is divided into two parts; Lehok Boi, the northern, has anchorage in the southern part near the 10-fathoms line, over sand. In the middle of this bay, and connected by a drying reef, are two rocky islets, the northern being 69 feet high.

Laju Pamale, the southern bay, affords a more spacious anchorage. Off the southern point of this bay is an islet, 200 feet high, connected to the coast by a drying reef, and half a mile to the northward is Tukoh Seri Kaja, 135 feet high.

Tukoh Lehok Gebah lie to the south-westward of Seri Kaja, and about the same distance from the coast.

About one mile to the westward and near the 100-fathoms line is a bank of 20 fathoms; the overfalls that mark this spot give it the appearance of a serious danger.

LIGHT (intended).—A *white flashing* light is to be exhibited from a lighthouse on Tuhok Lehok Gebah; it will be visible from a distance of about 15 miles.

Toro Letuhoh is high, and very conspicuous from the north and south, having the appearance of a sugar-loaf; a reef extends for a

General charts 1696, 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 10' E.

distance of 3 cables to the southward, with a rock above water at the extreme.

Labuan Letuhoh.—From Toro Letuhoh the coast turns sharply to the north-eastward, forming Labuan Letuhoh, which has good anchorage in the northern part between the 10 and 20-fathoms lines. A rocky islet lies on the broad coast bank north of the eastern point of the bay.

Coast.—Southward of Labuan Letuhoh the coast is high and very steep-to, without any dangers. In the southern part is Labuan Langkoi, which is, however, too deep to afford any anchorage. In the middle of this bay is a rock which is usually above water.

Langkoi or Chimney rock (*Lat. 8° 44' S., Long. 119° 22' E.*), off the south-west point of Komodo, is a bold islet, 325 feet high, with a knob or upright rock resembling a chimney on its slope, which renders this a good mark in approaching the strait from southward. Southward of this island, and 2 miles from Komodo, is a rock which shows above water.

Directions for Sapeh strait.—Sailing vessels steering northward for Sapeh strait, with light or easterly winds, may sight the west end of Sumba island. This island is of middling height, and may be seen in clear weather about 30 miles, and the peak near its western point about 60 miles off. With westerly winds, which blow strongly, and produce easterly currents, the south coast of Sumbawa may be approached, as it is mostly high, except opposite to the bottom of Saleh bay, near the middle where there is a low point, covered with trees.

Enter the strait with the east point of Kelapa westward of 0° true; pass eastward of that island, and bring the lighthouses on it in line astern, bearing 172° true, which leads between Mata Gateh and Sento-do island on the western side and Tukoh Mapinka and Barsu Panda on the eastern side; the currents not being so strong here, an anchorage may be obtained when the tide is contrary.

If the route through Salayar strait is to be pursued during the north-west monsoon, borrow towards the east side of Sangeang, and keep well to windward, because by the strong easterly current, sometimes of 32 miles in 24 hours, ships are thrown to leeward of the islands fronting the south end of Salayar, and obliged to pass southward of them.

When bound to Salayar strait in the south-east monsoon the passage east of Banta island may be taken, if not in want of water, in which case shape course to pass near Langkoi island, thence to the westward of Nisa Léme, between Tuhok Gili Banta and Luluh Tare, and from here steering northwards out of the strait, but the western channel seems preferable.

General charts 895, 941b, 2759a.

Chart 3756, Linta and Molo strait. Var. 2° 10' E.

NORTH COAST OF KOMODO. — The north coast of Komodo forms three bays, Telok Batu Moncho, Telok Gili Lawa, and a small bay to the eastward. Toro Batu Moncho (*Lat. 8° 26' S., Long. 119° 26' E.*), the north-western point of Komodo, although not high is very conspicuous from seaward.

Telok Batu Moncho, the western bay, has anchorage in about 30 fathoms. Between the 20 and 30-fathoms lines the depths are very regular, over sandy ground; the 20-fathoms line is from one to 3 cables from the shore. The greater part of the bay is lined by a narrow coast reef with a sandy beach.

Telok Gili Lawa is a large bay separated from Telok Batu Moncho by a high tongue of land, which rises from a height of 778 feet near the northern extreme to 1,388 feet 2 miles further south.

The eastern side of the bay is formed by the islands Gili Lawa Darat and Gili Lawa Laut.

In the south side of Telok Gili Lawa are three small bays; the middle one has the best anchorage, as the depths are more regular; the eastern point of this small bay somewhat resembles an elephant.

Gili Lawa Darat, the southern island, is separated from Komodo by a narrow passage 120 yards broad and 6 fathoms deep, and from Gili Lawa Laut by a passage 60 yards wide and 5 fathoms deep; through both these channels a strong current runs. The island is surrounded by a coast reef with here and there a small beach; it is 659 feet high in its highest part.

Gili Lawa Laut, the northern island, is divided into two parts, joined by a narrow tongue of land 125 yards broad; the eastern part has two summits, 541 and 540 feet high.

Toko Toko is a small islet 2 miles to the northward of Gili Lawa Laut, and is surrounded by a drying bank.

Rocks.—At a distance of one mile, 276° true, from the north-east point of Gili Lawa Laut is a rock awash at low water, and at a distance of $1\frac{3}{10}$ miles, 294° true, a rock with a least depth of 11 feet.

Anchorage.—The most convenient anchorage is in the middle bay in the south part of Telok Gili Lawa, with the eastern point of this small bay in line with the south extreme of Gili Lawa Darat, bearing 80° true; the depth here is 24 to 26 fathoms, over sand. When making for this anchorage from the eastward, the passage between Toko Toko and the rock with 11 feet water over it to the southward should be taken in preference to passing to the southward of this rock. A leading mark for this channel is the northern peak

General charts 1696, 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 10' E.

of Sabolan Besar in line with the saddle between the two summits of Seraya Besar, bearing 83° true.

To the eastward of Telok Gili Lawa is a small bay which runs inland for about a mile; the shore of this bay is lined with a drying reef, and on the eastern side is a rock which dries at low water.

East coast of Komodo.—This coast is generally steep, and variable in form; many small rocky islets lie close by the shore. Off the north-east point of Komodo are the Bugies islands; the south-western island is 507 feet high, and the north-eastern 443 feet. From here the coast runs to the southward for 6 miles to Toro Kuning, and is bordered by a broad coast reef with numerous scattered reefs with deep channels between.

Sabita island, 507 feet high, lies on the coast reef 2 miles to the southward of Bugies islands; south-westward of it is a steep rock.

Makasser reef, the north extreme of which is nearly a mile southward of the Bugies islands, dries over its whole extent, is $1\frac{1}{2}$ miles long north and south, and half a mile off-shore.

Gili Makasser lies on the northern part of Makasser reef, and, owing to its light-green colour, is a conspicuous mark.

Tambunan Singkala is a high sand and coral bank lying on the eastern side of a drying reef. To the southward of it, and separated by a narrow channel, is another large drying reef; between these two and the coast are numerous reefs.

Reef.—To the south-eastward of Tambunan Singkala, and at a distance of $1\frac{3}{10}$ miles, 260° true, from the north point of Mauan island is a dangerous coral reef with $1\frac{1}{2}$ fathoms water over it.

Toro Kuning (*Lat. 8° 36' S., Long. 119° 35' E.*) is a sharp rocky point at the end of a tongue of land which slopes down gradually from the hill behind. To the westward of Toro Kuning is a peculiar hill, 1,038 feet high, whose summit is formed of several sharp crests.

Rocks.—To the southward of Toro Kuning, on a small drying bank, are three rocks above water; the outer one lies at a distance of 5 cables, 150° true, from this point.

Punya is the largest of a group of three islands off Toro Lia, and is separated from this point by a narrow channel, in the western part of which is a coral reef with $1\frac{1}{2}$ fathoms water over it; the highest part of Punya, near the south-western side, is 180 feet. On the eastern side is a small reef, with two rocks on it awash at low water.

On the south-western side of Punya is the islet Lawa, and about 4 cables to the southward is the third island of the group, which is

General charts 1696, 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 10' E.

separated from *Punya* by a clear channel with depths of 25 to 29 fathoms.

Between *Punya* and *Toro Kuning* is good anchorage.

Telok Slawi, the bay between *Toro Lia* and *Toro Lawi*, has on the north-eastern and south-western sides two deep bights, named *Soro Lia* and *Soro Go*, respectively. On the eastern side of *Soro Lia*, at a distance of 2 cables from the shore, is a small coral reef with 5 feet of water over it.

Lassa island, midway between these two bights, and surrounded by a small reef, is about 100 feet high, and has a conspicuous tree on the summit. On the shore opposite *Lassa* is the small village *Komodo*, off which is very good anchorage.

To the southward of *Komodo* is a small islet about 100 feet high standing on the drying reef, and almost in the middle of *Soro Go* is an islet surrounded by a drying reef and a rock off the north-eastern point.

Toro Lawi (*Lat. 8° 37' S., Long. 119° 30' E.*) is a rocky point at the extremity of the peninsula to the southward of *Soro Go*; to the westward of this point is a small islet on the drying reef.

Coast.—Between *Toro Lawi* and *Toro Langkoi* the coast forms several bights, and is fronted by a small coast reef, with here and there sandy beaches.

About 2 miles to the southward of *Toro Lawi* is an islet, 315 feet high, in the shape of a sugar-loaf, and $2\frac{1}{2}$ miles further is *Logo* island, 345 feet high; coming through *Linta* strait from the northward this island is conspicuous owing to the clear white colour of the stone which forms its north-eastern side. Between *Logo* and the coast is a reef, which dries at low water.

In *Telok Logo* and *Lehok Sera* vessels can anchor.

The south-eastern point of *Komodo* is a long, narrow tongue of land, 822 feet high, which can be seen from a great distance. Half a mile to the eastward of this point lies a rock, 192 feet high.

South coast of Komodo.—The south coast of *Komodo*, named *Toro Langkoi*, is almost everywhere very steep, and the sea breaks with great violence on it, especially in the east monsoon.

Almost in the middle of the south coast, and separated by a narrow channel about 3 cables broad, is an island, 980 feet high, to the westward of which is anchorage in 24 fathoms, over sand and coral, but several rocks are charted north-westward of the island.

LINTA STRAIT, on the eastern side of *Komodo* island, has three outlets in the northern part; the two western are separated by *Tatawa* and both *Siaba* islands; the eastern one is between the islands *Kanawa*, *Misa*, and *Mengyatan* on the one side, and *Pungu*, *Bang-*

General charts 1696, 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 10' E.

kau, Papagaran, and Tengah islands, on the other side. The southern part of the strait has two outlets divided by the island Padar; the western of these is a clear channel, the eastern, between Padar and Rinja islands, is very narrow. View at page 238.

Tides.—In Telok Slawi, east coast of Komodo, the tide is usually of a double-daily character.

The double-daily tide has springs $1\frac{1}{2}$ days after full moon and new moon, with high water at 0h., and a rise of 7 feet, increasing to over 8 feet about the second half of March and September, and decreasing to 6 feet about the second half of June and December. Neaps occur the same interval after the quarters, with high water at VIh. and a rise of 2 feet increasing to $3\frac{1}{2}$ feet about the second half of June and December, and decreasing to one foot about the second half of March and September.

The single-daily tide has high water on 1st January at about VIh. p.m.; 1st April about mid-day; 1st July about VIh. a.m.; and 1st October about midnight; springs are half a day before the moon's greatest declination, with a rise of 3 feet, increasing to $3\frac{1}{2}$ feet about the second half of June and December, and decreasing to $2\frac{1}{2}$ feet about the second half of March and September; neaps occur the same interval before the moon's declination is 0°, with a rise of half a foot, increasing to one foot in the second half of June and December; in the second half of March and September the rise is imperceptible.

Tidal streams.—In Linta strait the flood stream flows to the northward and divides north of the islands in the strait, one part flowing westward along the north side of Komodo, the other eastward along the north coast of Flores; the ebb stream flows to the southward. Among the islands and reefs the stream is split up, causing many whirlpools and eddies.

On the western side of the southern entrance the stream turns 2 hours after the time of high and low water, and has been known to attain a velocity of 6 miles an hour during springs; in the broad part of the channel between Padar and Rinja the current is equally strong, but southward of the narrow part of this channel it runs at 9 miles an hour in spring tides.

Islands between Komodo and Flores.—Tatawa. (*Lat. 8° 31' S., Long. 119° 39' E.*), 305 feet high, is steep on the northern side; the southern part is low and swampy in parts. A drying reef extends for 3 cables from the southern side.

About three-quarters of a mile to the south-westward of Tatawa is a rock in the form of a sugar-loaf, 89 feet high, and at a distance of 9 cables, 245° true, from it is a smaller rock, 20 feet high.

General charts 1696, 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 10' E.

Siaba Besar, separated from Tatawa by a channel 7 cables broad, is a coral island with a long ridge, 448 feet high in the highest part. The coast reef is small except on the northern side, where it extends for half a mile.

Siaba Kechil lies 2 cables from its western side, and is 148 feet high.

Mauan is overgrown with shrubs, and has three summits, the highest being 123 feet. It is surrounded by a drying reef, and on the southern side a sandy beach with shallow water extending for half a mile. The southern extreme of Siaba Besar in line with Mount Manjaga (Flores), on the bearing 88° true, leads to the southward of this shoal water.

Sabayor Besar lies, with a number of smaller islands, on a plateau over which the general depth is less than 20 fathoms; between these islands are deep gullies. Sabayor Besar has a very sharp, conspicuous summit, 748 feet high.

Sabayor Kechil, 197 feet high, is on the western side of Sabayor Besar, and separated from it by a narrow channel.

Reef.—Half a mile to the northward of Sabayor Besar, with the west extreme of Sabayor Kechil bearing 222° true, is a reef, with 3 fathoms of water over it. On the western side of this reef is a patch of 6 fathoms least water.

Mengyatan, 394 feet high, in the north-west part, is steep to on the western side, the 20-fathoms line running a cable from the shore; off the north-eastern point a bank, with a least depth of 2 fathoms over it extends for $1\frac{2}{3}$ miles. The north-west point of Mengyatan in line with the southern extreme of Siaba Besar leads to the northward of this shoal.

Kanawa (Lat. $8^\circ 30' S.$, Long. $119^\circ 46' E.$), $1\frac{1}{2}$ miles eastward of Sabayor Besar, is 300 feet high, and has a few dwellings on the south-western side. On the drying reef on the northern side is a white lion-shaped stone, and northward of the drying reef is a reef with a least depth of $2\frac{1}{2}$ fathoms over it. Shoals and reefs extend for 2 miles to the southward of Kanawa.

Misa, the small island to the southward of Kanawa, is inhabited. Eastward and southward of Misa are drying reefs for a distance of a mile.

Pungu islands lie on the eastern side of the eastern channel to Linta strait. Pungu Besar has two summits, the north-eastern and higher being 482 feet; some dwellings stand on the southern shore, and on the drying reef on this side of the island are two islets.

General charts 1696, 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 10' E.

Pungu Kechil is joined to Pungu Besar by a drying reef.

Reefs.—Nearly 4 miles to the northward of the Pungu islands is a stone and a coral reef with a least depth of $1\frac{1}{2}$ fathoms over it.

Midway between this reef and Pungu Kechil is a long reef extending for about $1\frac{1}{2}$ miles in a north and south direction, with a least depth of $1\frac{1}{2}$ fathoms, and depth of 24 to 42 fathoms round it.

Bangkau and Kukusan lie together on a large drying reef. Kukusan is 374 feet high, and is in the form of a sugar-loaf; Bangkau is about 70 feet high. To the northward of Bangkau is a small detached drying reef.

Papagaran islands also lie on a large drying reef. Papagaran Besar is 423 feet high, on its western side is a small village, and on the eastern, a swamp.

Tengah islands.—Tengah Besar is 458 feet high, and joined to Tengah Kechil by a drying reef. At a distance of 2 cables from the north-west point of Tengah Besar is a small rock.

Padar island, situated in the southern part of Linta strait, has three summits; the two western are 635 and 915 feet high; the eastern (*Lat. 8° 39' S., Long. 119° 36' E.*), 881 feet high, is in the form of a pyramid and is very conspicuous. The south point of this island is a narrow tongue of land extending about a mile, and 699 feet high. On the coast reef on the eastern side is a conspicuous rock in the shape of a cube.

Anchorage.—The large bay on the southern side of the island affords good anchorage, and the current is not felt here. On the north-western side the best anchorage is in the small creek in the middle of this part of the coast.

Padar Kechil, on the south-western side of Padar, is a small islet 423 feet high.

A reef, with 3 fathoms of water over it, lies to the eastward of Padar Kechil, at a distance of 8 cables, 290° true, from the south point of Padar.

Sarang is a rock 90 feet high, and is separated from Padar Kechil by a deep channel. On the drying reef round Sarang are several small rocks.

Pillar rock, 2 cables to the eastward of the south point of Padar, is in the shape of a pillar and very conspicuous.

Payung, 118 feet high, lies almost in mid-channel, between Padar and Rinja islands.

RINJA ISLAND is mountainous, and densely overgrown in the southern part. The highest point of the island, in

General charts 1696, 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 10' E.

the south-eastern part, is 2,190 feet; Doro Raja (*Lat. 8° 39' S., Long. 119° 47' E.*), near the north-eastern point, is 1,151 feet high, and is a good landmark.

West coast of Rinja.—**Sarai island** lies to the southward of the north-west point, and is joined to the coast by a drying reef; 2 cables from its south-eastern point is a rocky islet with shoal water beyond.

Lehok Karbau is a large bight in the coast between Toro Lehok Karbau and a point 2 miles to the northward, off which is a rocky islet; between these two points is a sandy beach.

Lehok Gingo, the bay to the southward of Toro Lehok Karbau, is indented with many small creeks; in the northern part are some islets and rocks. This bay, in which there is no current, provides the best anchorage on the west coast of Rinja.

Rock.—A rock, awash at low water, lies 5 cables to the westward of the south point of Lehok Gingo, with Toro Lehok Karbau bearing 28° true, distant $1\frac{2}{10}$ miles. Cube rock, on the eastern side of Padar, kept between that island and the western side of Sarai, on the bearing 3° true, will pass 5 cables to westward of this danger.

Toro Lehok Banda is a rocky point of a light green colour. Two rocks, which dry at low water, lie one and 2 cables off this point.

Lehok Uwada Sami is a large bay on the southern side of Rinja, in which lies the island Uwada Sami. Between the north point of this island and the coast are several rocks and drying reefs.

Anchorage.—The best anchorage is in the eastern arm of the bay, near the sandy beach at the head in about 14 fathoms water, over sand and coral.

North coast of Rinja.—**Dangers.**—At a distance of $1\frac{4}{10}$ miles, 315° true, from the west point of Lehok Kima, is a rock with less than 6 feet of water on it; nearly 2 cables to the southward of this is a rock which shows above water, and midway between this rock and the shore are one rock above water, and two rocks with less than 6 feet water over them.

Lehok Kima is a deep bay about $1\frac{1}{2}$ miles wide at the entrance. In the southern part of the bay are two creeks, the eastern one having a small settlement of fishermen. On the western side of Lehok Kima are three rocks, the northern one having $1\frac{1}{2}$ fathoms water over, the other two 3 feet water.

Eastward of Lehok Kima is the small bay, Lehok Buaya.

Anchorage.—Lehok Kima affords good anchorage over muddy bottom and undisturbed by current. Coming from the westward a vessel must be careful to avoid the rocks off the north coast of Rinja, mentioned before; the south side of the rocky islet off the middle of

General charts 1696, 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 10' E.

the north-western side of Padar in line with the north-west point of Rinja, on the bearing 237° true, passes 4 cables to the northward of these dangers.

Directions for Linta strait.—The western of the northern entrances to Linta strait presents no difficulty. Approaching from the northward the three summits of Padar island are visible; steering for the conspicuous pyramid summit, 194° true, leads between the two rocks south-westward of Tatawa and between the reef of 1½ fathoms and Mauan island.

The middle entrance, between Siaba Besar and Mengyatan, is free from dangers except for the rocks off the north coast of Rinja to westward of Lehoc Kima.

Approaching the eastern entrance from northward bring the saddle of Pungu Kechil in line with Mount Manjaga on the bearing 145° true; when the lion-shaped stone north of Kanawa is in line with the northern of the rocks north of Sabayor Besar shape course 182° true, and when the south-east point of Pungu Besar is in line with Flores saddle, bearing 71° true, the course, 251° true, will lead through the channel north of Pagaran and Tengah islands.

The strait westward of Padar is clear and broad, but great attention must be paid to the currents, which are strong and variable.

The channel between Padar and Rinja is not to be recommended, as the northern part is very narrow.

Chart 1696, Lombok to Flores.

ISLANDS NORTH OF SUMBAWA.—In Chapter VI. a description was given of the islands in the Java sea as far eastward as the Kangeang group and Willem I. reef. Those between the Kangeang group and Salayar islands will now be described; the information about them is very slight.

PULO TENGA, or PATERNOSTER ISLANDS, are composed of groups or chains of islands, for the most part low and wooded, extending about 55 miles east and west, and 30 miles north and south. They were examined in 1891, and the Dutch chart, on which the Admiralty chart is founded, affords all the information available about them. The North-east Paternosters form a separate group.

Poposa (Poposang), the north-western island (*Lat. 7° 30' S., Long. 117° 11' E.*), is a long low island surrounded by a reef which extends 3 miles to the north-westward. A detached reef lies 5 miles 328° true from the west point of the island, and another 4 miles 249° true from the same point. Karang Poposa lies 5 miles to the southward of Poposa island.

General charts 1696, 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 10' E.

Sadapur or Zandbuis banks, are two large banks 9 miles southward of Karang Poposa; one is partly covered with trees.

LIGHT.—A *red occulting light every four seconds*, eclipse *two seconds*, is exhibited at 59 feet above high water from an iron framework on the east side of the western drying Sadapur bank, and should be seen from a distance of 12 miles. The light is unwatched.

Sakunchi, or Maria Reigersbergen bank, on which there are several islets, is the southern of the Paternoster group.

LIGHT.—A *white occulting light every four seconds*, thus:—light, *two seconds*; eclipse, *two seconds*, is exhibited, at 41 feet above high water, from a white frame lighthouse on the south-eastern end of Sakundi, and should be seen from a distance of 11 miles.

Huzaar shoal, of 4 fathoms (the Dutch sailing directions give 2 fathoms), 5 miles south-eastward of the eastern Sadapur bank, is clearly recognisable. On this reef is the wreck of a schooner.

Satengar island lies 6 miles to the eastward of Poposa island, and is fringed by reefs to the distance of one mile. Karang Satengar is 4 miles, 204° true, from the west point of Satengar island.

Five miles south of the east end of Satengar are reefs extending eastward for 3 miles.

Sailus islands, 5½ miles east of Satengar, are three in number, Sailus Besar, Sailus Kechil, and Perbatuan, with passages between the reefs that surround them.

Sauyun islet lies 9 miles, 22° true, from Perbatuan, from thence a chain of islands and reefs extends in a south-easterly direction for 31 miles to Karang Satungul.

Karang Satungul.—On Karang Satungul, the eastern reef of Pulo Tenga, are a number of small islets covered with vegetation.

A depth of 12 fathoms, the bottom being visible, was reported in 1885 to lie 16 miles, 112° true, from Karang Satungul, and an atoll-shaped shoal (*Lat. 7° 39' S., Long. 118° 23' E.*), 9 miles further east, about 3 miles in extent, in an east and westerly direction, with a depth of 60 fathoms in the centre, and from 26 to 33 fathoms round the edges. It is probable that less water may exist on it.

Directions.—There are channels between these different groups of islands, and several vessels have passed through them, but the passages have not been thoroughly explored, and the positions of many of the dangers not yet determined; it is therefore advisable to avoid them.

Vessels passing between Alas strait and Makassar strait use the channel between the Kangeang group and the Pulo Tenga, which is 60 miles wide and free from danger with the exception of Willem I. reef (page 179). Vessels passing eastward from Alas strait will avoid the dangers by not going north of the parallel of 8° S. latitude.

General charts 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 20' E.

PULO SABALANA, or POSTILLON ISLANDS, consist of an extensive chain of low islands surrounded by reefs, extending some 70 miles north-east, and a cross chain of islets and reefs extending 30 miles north-west.

Little is known of the group beyond such features as are shown on the chart.

The westernmost island is Kembang (Kimbah) Lamari, and 9 miles to the southward of it is Tukoh Batu. Between this last and the Pulo Tenga is a channel 15 miles wide, apparently unexamined. Lamarua, the southernmost islet of the group, has an extensive reef to the north-westward, the extent of which is unknown; 80° true, 8 miles from Lamarua, is a reported depth of 7 fathoms.

Jailamu, the northern island (*Lat. 6° 33' S., Long. 118° 47' E.*), has a small lump over the centre, and from thence the islands and reefs form a continuous chain for 30 miles to the eastern island (*Lat. 6° 50' S., Long. 119° 11' E.*), which, like those near it, is low and wooded. There are channels through this group; it would, however, be most dangerous to attempt them without a pilot.

Anchorage in 13 fathoms, near the edge of the reef, has been found about 3 miles north-west of Sabalana island.

In the large semicircular space between these islands and North-east Paternosters, many reefs continue to be reported; the chart is the best guide.

North-east Paternoster islands. — From Bangkawang (*Lat. 6° 38' S., Long. 118° 21' E.*) a bank of soundings, varying from 5 to 27 fathoms, extends 9 miles south, and 6 miles south-west of the island, enclosing a group of three other islands. Between 4 and 6 miles to the eastward of Bangkawang there is a detached bank about 2 miles in extent. Discoloured water was observed 6 miles north, and there appears to be a reef 3 miles north-east of the island.

Directions.—Vessels bound for Alas strait from Salayar strait usually pass eastward of the Pulo Sabalana. Some vessels from Makassar have passed between the Pulo Sabalana and N.E. Paternosters, but it is advisable to pass outside all the islands, giving them a wide berth, especially at night.

The usual track bound from Sapeh strait to Makassar or Salayar straits is also east of the Pulo Sabalana. In the north-west monsoon it is advisable to sight the eastern Sabalana group, to avoid being driven too far to leeward. In the south-east monsoon vessels should keep along the Sumbawa coast till Sangeang island bears 204° true and then steer to the northward. Country vessels from Java to Makassar,

General charts 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 20' E.

however, work eastward southward of the Kangeang islands, and pass northward of the Pulo Tenga and Sabalana.

Currents on the north coasts of islands east of Java—beyond the influence of tidal streams in narrow straits—are largely wind-drifts, the east-going being stronger than the west, and average from 10 to 18 miles a day, with an occasional maximum of over 40 miles. In both monsoons the constant current from Makassar strait presses them southward towards the islands.

General charts 941b, 2759a.

CHAPTER IX.

ISLANDS EAST OF JAVA.—FLORES, SUMBA, OMBAI, TIMOR, WETTA, MOA, WITH ADJACENT ISLANDS AND PASSAGES; TANAH JAMPEA, AND TIGER ISLANDS.

VARIATION IN 1914.—Increasing about two minutes annually.

Charts 941b, 942a, Eastern archipelago. Var. 2° 20' E.

FLORES or MANGARAI ISLAND is nearly 200 miles long, east and west, varying generally in width from 20 to 40 miles. The island is traversed by a mountain chain whose southern slopes are steep and volcanic, while to the north and west the ground falls gradually towards the coast. The north-east peninsula consists of high mountains which form three projecting promontories to the east. Of the active volcanoes the principal are those of Lobetobi at the east end, 5,589 feet high, and Iné Rié, on the south coast, 7,368 feet high.

Of the interior very little is known to Europeans. The natives are a tall robust people belonging to the dark Papuan race, but more nearly allied to the Timorese than to the New Guinea people. A considerable number of Bugis are settled at Ende, while emigrants from Bima in Sumbawa have settled in several villages.

West Flores is under the administration of the Resident of Celebes; the remainder is under the Resident of Timor, and is divided into four parts, North, South, East Flores, and the Solor islands.

The entire coast line is broken and irregular, and many of the bays offer good anchorage, being protected by islands. The only places of trade are Ende, Larantuka at the east end, and Maumeré on the north coast. The chief exports are ponies, wax, and sandal-wood; rice, maize, cotton, and sappan-wood are grown, but there is little trade.

Chart 3756, Linta and Molo straits.

WEST COAST OF FLORES.—Seraya islands lie to the northward of Toro Wadu Ramba (*Lat. 8°26' S., Long. 119°52' E.*), the north-west point of Flores. Seraya besar, the northern, has three summits, the middle and highest, near the western side of the island, being 625 feet high; on the south-western side is a small village. A ridge extends for a mile from the north-east point, with a number of reefs on it, and a least depth of $1\frac{1}{2}$ fathoms.

General charts 1696; 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 20' E.

Seraya kechil is low, and surrounded by a drying reef, which extends half a mile on the eastern side; the channels between these two islands, and between Seraya kechil and Flores, are clear.

Sabolan islands are separated from Seraya besar by a clear deep passage, 2 miles broad. Sabolan besar has two summits, the northern being 458 feet high; it is covered with brushwood, and the coast is rocky except on the south-east point, where there is a sandy beach and a single house.

Sabolan kechil (*Lat. 8° 23' S., Long. 119° 48' E.*), 212 feet high, is thickly covered with shrubs, and steep-to.

Toro Wadu Ramba, the north-west point of Flores, is steep, and somewhat rounded, and is the extremity of a hilly peninsula showing two summits from an east and west direction, the southern being 709 feet high.

Rocks.—One mile to the south-westward of Toro Wadu Ramba is a dark-coloured rock, 79 feet high, resembling a lion lying down with head to westward. At a distance of one mile, 252° true from this rock, lies a reef of 2½ fathoms water.

Plan of Labuan Bajo on 895.

Coast.—Southward of Toro Wadu Ramba the coast forms a large bay, bounded on the south side by Bajo and the islands westward. On the east side of this bay two islands lie on the coast reef; Kukusan, the outer, has a sharp summit, 521 feet high, in the shape of a sugar loaf, and its dark colour makes it conspicuous against the coast behind. Close to the shore at the back of the bay is a very conspicuous light green hill, 192 feet high; in line with a low sandy point to the southward it forms a good mark for entering Labuan Bajo. About 2½ cables to the southward of Kukusan is a rock 99 feet high, steep-to on all sides except the eastern, where the 3-fathoms line runs at a cable distance. In the southern part of the bay, under the north coast of Bajo, are three reefs; the middle one partly dries at low water.

Chart 3756, Linta and Molo straits.

At the entrance to the bay lie two reefs to the north-eastward of Tebolon; the outer has 2½ fathoms least water over it, the inner 4½ fathoms. The conspicuous light green hill open just northward of the rock, south of Kukusan, will pass northward of these reefs.

Tebolon, Kokotoan, Tenga, and Bajo.—Tebolon, the western of these islands, is covered with reeds, with a cocoanut plantation and a few dwellings on the south side; the western part is 84 feet high. It is separated from Kokotoan by a passage obstructed by two low rocks, and of no importance to shipping; Kokotoan is 295 feet high.

General charts 1696, 941b, 2759a.

Plan of Labuan Bajo on 895. Var. 2° 20' E.

Tenga is triangular in form, and has a summit on each point; the eastern and highest is 399 feet above the sea, and has a conspicuous bare strip. Bajo is 320 feet high, and has a village on the eastern side; to the southward is the small islet Salama, with a beacon with triangular topmark. With the exception of Tebolon these islands are all joined by a drying reef; outside this reef, one cable to the southward of Kokotoan, is a rock awash at low water.

Labuan Bajo, the channel between Bajo and Flores, affords good but confined anchorage in 9 to 10 fathoms, and the stream never exceeds half a mile an hour; the northern entrance, eastward of a reef of $2\frac{1}{4}$ fathoms, is barely half a cable broad, with a depth of 4 fathoms. The village Bajo, with a flagstaff (*Lat. 8° 29' S., Long. 119° 53' E.*) on the shore, lies on the eastern side of the strait; to the northward is a conspicuous white tomb.

The village Padé is situated one mile to the southward of Bajo, between two conspicuous steep parts of the coast.

Supplies.—Except fish, bananas, &c., few provisions can be obtained at Bajo. Water can be obtained from the river south of the village, but boats cannot cross the coast reef before the mouth.

Chart 3756, Linta and Molo straits.

Reefs.—At a distance of $1\frac{4}{10}$ miles, 182° true, and $1\frac{1}{2}$ miles, 164° true, from the west point of Tebolon, lie two reefs of $3\frac{3}{4}$ fathoms.

Directions.—Bound for Labuan Bajo anchorage from the northward, vessels may pass westward of the Sabolan islands or between them and Seraya besar, and steering for Batu Putih on the bearing 161° true; when the western of the two rocks between Tebolon and Kokotoan comes in line with Kukusan, the course is 114° true for the north end of the steep part of the coast southward of Padé village.

Plan of Labuan Bajo on 895.

When Bajo village can be seen between Bajo and Salama, course may be altered to 93° true, until the low sandy point north of the village is in line with the conspicuous 192-feet hill, bearing 22° true, which will lead to the anchorage.

Approaching from westward the 709-feet summit of Toro Wadu Ramba in line with the lion-shaped rock westward, bearing 86° true, leads northward of the reefs north of the Pungu islands. Tebolon in line with the highest summit of Tenga, 103° true, leads between the reefs. These marks should be held until Batu Putih bears 161° true, when the above directions for the anchorage may be followed.

There is also a passage between Pungu islands and the reefs to northward, steering for Mount Manjaga in line with the saddle of Pungu kechil, bearing 145° true, until the south side of Kanawa is in line

General charts 1696, 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 20' E.

with the south-western peak of Gili Lawa Laut, keeping this mark astern with course 105° true.

Coast.—Batu Putih is a very conspicuous white point, 246 feet high; Manjaga island, lies on the coast reef, one mile to the westward, but is not easily recognised from seaward; 4 cables to the north-westward are two patches of 2 and $1\frac{1}{4}$ fathoms.

From Manjaga to the entrance of Molo strait the coast is mostly swampy; Mount Manjaga is a conspicuous, conical hill, 1,206 feet high. The following islands and dangers lie near the coast:—

Kelor, about 196 feet high, is steep-to on the north and west sides; on the Flores coast reef to the south-eastward is a bare rocky islet.

Gadoh is hilly, with a marshy coast, except the west point, which is rocky; between this island and Boasala is a small bay free from dangers.

Half a mile to the northward of Gadoh is a reef which partly dries at low water, and not always visible by discolouration when covered; to the westward, in the channel between Bangkau and Papagaran islands, are four large drying reefs, all steep-to. At a distance of 2 cables, 308° true, from the west point of Gadoh, is a small reef of 3 fathoms.

Boasala has a flat summit, 512 feet high, with a conspicuous bare patch of reddish stone on the south-west side; Nisa Purung lies on the coast reef to the southward.

MOLO STRAIT, between Rinja and Flores, is only navigable for small vessels on account of the narrow northern entrance, where a strong stream runs. Praus make use of the strait during slack water of neaps, between one and three days after the quarters. Anchorage may be found in So Walu, So Lo-oh, Telok Kenupur and Lehek Rasé; for large vessels So Lo-oh is the best, as there is more room. Small vessels find good anchorage before Linteh (*Lat. 8° 40' S., Long. 119° 49' E.*), and in the west monsoon, eastward of the north point of Gili Mota.

Tides. — In Telok Perapat, on the east side of the southern entrance to Molo strait, the tide is mixed with a strongly predominating double-daily character.

The double-daily tide has springs $1\frac{1}{2}$ days after full and change with high water at XIh. 30m., and a rise of $8\frac{1}{2}$ feet; neaps $1\frac{1}{2}$ days after the quarters with high water at Vh. 30m., and rise of $3\frac{1}{2}$ feet.

The single-daily tide has high water 1st January about VIh. p.m.; 1st April, at noon; 1st July, at VIh. a.m.; and 1st October, at midnight. Springs occur just before the greatest declination of the moon,

General charts 1696, 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 10' E.

with a rise of 3 feet; neaps shortly before 0° moon's declination, with a rise of half a foot.

The high and low waters of the spring tides of both groups cannot occur together. The highest water level is reached about the middle of October at XIh. 30m. p.m., and about the middle of April at XIh. 30m. a.m.; the lowest about the middle of January at Vh. 30m. a.m., and the middle of July at Vh. 30m. p.m.

Western side of Molo strait.—So Lo-oh, on the east coast of Rinja, affords anchorage for large vessels; in Lehok Oto, the southern part of the bay, is a clump of cocoanut palms and the remains of an old settlement. A reef of 3 feet water lies at 3 cables distance from the coast here. On the drying bank in the northern part of So Lo-oh is a rock 25 feet high.

Southward of So Lo-oh are numerous small bays and outstanding points; Toro Walu is a narrow steep point. Toro Waingajah (*Lat. 8° 46' S., Long. 119° 44' E.*) can be recognised by the red-brown colour of the stone and by a cave; a rock awash at low water lies one cable off the point.

Eastern side of Molo strait.—Linteh village is situated at the head of a small bay south of the narrows; there is good anchorage off the village in 7 to 8 fathoms, over sand and coral, with Tukoh Selat Molo bearing 358° true, and just touching the Flores coast north of the bay.

At a distance of 3 cables, 15° true, from Toro Wairii, the southern point of the bay, is a depth of $3\frac{1}{4}$ fathoms; 3 cables further northward is a depth of $4\frac{3}{4}$ fathoms.

Toro Lajar, a bare, rocky point, 60 feet high, has the appearance of an island, and is very conspicuous from southward; about $1\frac{1}{2}$ cables to the northward is a $2\frac{1}{2}$ -fathom patch, and a mile to the southward is the islet Ini Tengah, lying on the edge of the coast reef.

Lehok Rasé and Telok Kenupur both afford anchorage; off the southern point of the latter are two rocks, the outer one is about 60 feet high. By Toro Rungking the coast is almost perpendicular.

Telok Perapat (Mangrove bay) is $3\frac{1}{2}$ cables wide between Brown Spot point and Harbour point, with soundings of 17 to 13 fathoms near the southern shore, and of 5 to 3 fathoms near the northern shore. Within is an inner cove $1\frac{1}{4}$ cables wide, with soundings of $4\frac{3}{4}$ fathoms. A fresh-water stream enters the north-east part. The northern point of the cove has a green appearance, then follows to northward a bold, rocky, wooded point, and the next point is high and overhanging. Close to the entrance lies Sendol islet, and outside 2 cables further is Baleh island.

General charts 1696, 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 10' E.

Alligator bay is 4 cables wide between Green point, which is low, and Bluff point, a perpendicular black cliff, to the south-eastward of which is Brown point, low, with a remarkable hole in a rock, appearing from the sea like a sail. The bay penetrates half a mile northward, and a considerable stream falls into its north-east angle; a steep bank extends one cable from the mouth of the stream, the beach is steep-to in every other part of the bay. Soundings decrease regularly from 50 fathoms at the entrance to 26 fathoms in the centre of the bay, and to 13 fathoms close to the edge of the bank fronting the river; the bottom consists of sand mixed with coral. There is anchorage in 30 fathoms, fine sand, with Green point bearing 232° true, and Bluff point in one with Brown point.

Tides.—In Alligator bay it is high water, full and change, at Xh. 40m.; springs rise 6 feet.

Plan of Molo narrows on 895.

Islands and dangers in Molo strait.—Tukoh Selat Molo (Lat. 8° 37' S., Long. 119° 49' E.) is a small rock in the northern entrance to the narrows, and lies about one cable from the Rinja shore.

Mulian consists of two islets almost in the middle of the narrows, with a shoal extending three-quarters of a cable to the southward.

Chart 3756, Linta and Molo straits.

Reboh, off Kerontong, is 276 feet high, and surrounded by a strip of sand. Nusa Kampas lies to the north-eastward. A reef, with 3 fathoms water over, lies 4 cables, 268° true, from the south point of Reboh; at a distance of 9 cables, 250° true, from the same point, is a rock awash at low water.

Muang, nearly one mile long in a north and south direction, has three summits, the southern and highest being 246 feet high. It is surrounded by a shoal bank of sand and stones extending for over half a mile on the eastern side. Nusa Dangka lies off the north-western side, and is separated from a reef extending 3 cables north-westward of Muang by a deep channel. A rock, awash at low water, lies 3 cables, 235° true, from the southern point of Nusa Dangka.

Baleh (Saddle island) has two summits, the highest 354 feet high, and is steep-to. Off the western side are a rock and small island.

Gili Mota, about 1½ miles in diameter, is 1,447 feet high, and forms a conspicuous mark when entering Molo strait from the southward. On the north-eastern point is a large tree with a white trunk.

Anchorage.—In the west monsoon there is good anchorage eastward of the north point of Gili Mota in 26 fathoms, over sand.

Reef.—In the middle of the channel, between Gili Mota and the

General charts 1696, 941b, 2759a.

Chart 3756, Linta and Molo straits. Var. 2° 20' E.

west coast of Flores, at a distance of 8 cables, 152° true, from the north-east point of Baleh, is a reef awash at low water.

Directions for Molo strait.—From the northward steer 180° true to pass between the islands Kelor and Kukusan, with Sabolan Besar bearing 0° true astern. When past these islands, and the north point of Kelor is in line with the largest of the two rocks to the south-eastward of Tebolon, bearing 25° true, steer 205° true, keeping this mark on astern. This course will lead eastward of the small drying reef half a mile to the northward of Gadoh.

Just before Kanawa is shut in by Bangkau, it will be seen that a steep, cliffy point on the west coast of Flores is in line with Mount Manjaga; keep this latter mark astern, bearing 68° true, the course 248° true will lead to northward of the 3-fathoms patch off Gadoh island. When the western sides of Pungu Besar and Bangkau are in line, steer past Boasala and Nisa Purung on a southerly course, and thence for the narrows.

Plan of Molo narrows on 895.

Tukoh Selat Molo and Mulian islets may be passed on either side, but there is more room to the eastward. Owing to the very strong current it is usual to wait for slack water before passing through the narrows.

Chart 3756, Linta and Molo straits.

From the southward Molo strait presents no difficulties, and can be easily recognised by Gili Mota. The channel westward of this island, being wide and free from danger, is preferable. If using the eastern channel, the dangerous reef midway between the north-eastern point of Gili Mota and Flores may be avoided by bringing the 615-feet high summit on Rinja island, in the gap between Baleh and the islet close westward, bearing 330° true; this course leads 3 cables westward of the reef, then steer to northward of Gili Mota.

Chart 1696, Lombok to Flores.

NORTH COAST OF FLORES.—**Telok Rangkoh and Telok Boleh.**—Between Toro Wadu Ramba and Toro Pontianah (*Lat. 8° 23' S., Long. 120° 1' E.*) the coast forms a large bay, which is, however, greatly obstructed by reefs, and in which are the smaller bays Telok Rangkoh and Telok Boleh, separated from each other by a steep point, 615 feet high.

In the south-eastern part of Telok Rangkoh is the village of Rangkoh.

In the middle of Telok Boleh is the island Boleh, on the southern side of which stands the village of that name. Good water may be obtained from a river at the head of the bay.

Gili Bodo, 448 feet high, lies to the northward of Toro Pontianah.

General charts 941b, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 20' E.

Vesuvius rock, close to the 100-fathoms line, lies 2 miles to the northward of Gili Bodo; from this rock a ridge extends to the westward, terminating 4 miles north of Seraja Besar, where there is a depth of 18 fathoms.

Plan of Telok Terang on 895.

Telok Terang, which affords good anchorage, has a narrow entrance only about 3 cables broad between the reefs extending from Toro Lehek Chamba, on the western side, and Toro Charmi (Lat. 8° 21' S., Long. 120° 7' E.), on the eastern side. Toko Sari, a small islet 58 feet high, lies on the coast reef, 6 cables to the north-eastward of Toro Lehek Chamba; Longgo, a low, wooded island, lies immediately northward of Toro Charmi. Except in the southern part Telok Terang is free from dangers.

Telok Levilia and Telok Bari.—Eastward of the island Longgo is Telok Levilia, entirely clear, and affording anchorage everywhere; the entrance is about 4 cables wide. The southern shore is swampy, the eastern, where the small village Bari lies, is wooded.

Telok Bari, between Toro Loji and Toro Batu Londa, affords anchorage in 20 to 22 fathoms, midway between these points, but it is open to north-west winds.

Plan of Telok Reo and Telok Linggeh on 2466.

Toro Besi is the extremity of a very conspicuous plateau rising to a height of 1,285 feet. This plateau forms a very distinct landmark when navigating along this part of the coast.

Telok Reo is the name of the bay between Toro Besi and Toro Lubu. In the southern part the Nanga Reo discharges, and is navigable for boats as far as Reo village (about 20 minutes rowing), where poultry and fruit can be obtained. About three-quarters of a mile to the eastward of the mouth of the river is the steep Doro Toi, 138 feet high; except for this hill the southern part of the bay is low and marshy. On Toro Lubu is a high house in the middle of the trees.

Telok Reo provides poor anchorage, the 100-fathoms line running close to the shore; small vessels can anchor eastward of the mouth of the river.

Telok Linggeh, the bay eastward of Telok Reo, between Toro Lubu and Tanjong Kuru Baja, affords the best anchorage for large ships on this part of the coast; in the south-eastern part vessels can lie in 25 to 30 fathoms, over mud. In the southern part of the bay

General charts 1696, 941b, 942a, 2759a.

Plan of Telok Reo and Telok Linggeh on 2466. Var. 2° 20' E.

is an inlet in the coast reef named Telok Baso, into which flows the Nanga Baso; the coast here is low and marshy.

Southward of the steep Tanjong Kuru Baja is a round-topped hill, 674 feet high.

Plan of Labuan Potah on 2466.

Labuan Potah, between Toro Barat and Toro Lari, affords anchorage for small vessels only. The shore of the bay is fronted with a sandy beach, with several streams which dry during the east monsoon; near the mouth of the Nanga Potah, in the eastern part of the bay, is the village Potah, where a few provisions can be obtained.

Chart 1696, Lombok to Flores.

Coast.—Toro Roto is about 2 miles eastward of Toro Lari, and is a broad spur of the mountains behind; it is easily recognised on account of the light brown colour of the hill sides. To the eastward is a conspicuous mountain, 2,080 feet high, with a sharp summit, and further inland, Olifantsberg, a mountain 3,692 feet high and somewhat resembling an elephant.

Chart 942a, Eastern archipelago, eastern portion.

Westward of Labuan Kulambu are two small creeks; Telok Nanga Loho, the western one, is half a mile deep, with an entrance only about half a cable wide, and depths of 6 fathoms; the eastern inlet is about $1\frac{1}{2}$ miles deep, with an entrance one cable broad, with 16 fathoms water, and can be recognised from seaward by a hill, 140 feet high, standing by itself close to the coast.

Plan of Riung bay on 2466.

Toro Padang (*Lat. 8° 20' S., Long. 121° 0' E.*) is the extremity of a peninsula extending about 2 miles out to sea. On its eastern side is Telok Damu, a clear, deep inlet connecting with Riung bay by a winding passage running between Untelué and the main island, which can, however, only be used by boats at high water. Eastward of Toro Padang the coast reef extends to about 4 cables, leaving a channel 2 cables wide to Telok Damu.

Riung bay is bounded by the islands Ruton and Tangil on the eastern side and Untelué on the western, and affords, in both monsoons, a safe and sheltered anchorage, either in the outer roadstead or further in, between the islands Babajié and Pata; the inner anchorage is, however, very confined and only suitable for small vessels. On the south shore of the inner bay is the beginning of the broad path which leads to the village Riung, situated on the

General charts 1696, 941b, 942a, 2759a.

Plan of Riung bay on 2466. Var. 2° 30' E.

crest of a hill 1,850 feet above the sea, and which takes about 2 hours to reach.

Directions.—For entering Riung bay the small islands Pata, Gong, and Sui, situated close to the southern shore, form good marks. Pata is a conical island with a few trees on the top; Gong is a bare, rocky islet; and Sui a round rock covered with undergrowth.

Entering the bay from eastward, Pulo Dua must not bear northward of 72° true; from westward, steer for Ruton on the bearing 146° true, taking care not to open Tangil south-westward of it. When Pata island bears 201° true, steer in on that course (on this bearing Pata is a little to the left of the ridge on which lies the village Riung) until Toro Padang is hidden behind Tanjong Simpang Sua, when anchorage may be found as convenient in the outer road. If anchoring in the inner bay, continue the course 201° true for Pata until Babajé island bears 230° true, steering thence by sight between the reefs off Lainjawa and Pata islands; the anchorage is midway between Babajé and Pata in 15 fathoms, over mud.

Chart 942a, Eastern archipelago, eastern portion.

Coast.—Between Tanjong Torieng and Nbai (*Lat. 8° 30' S., Long. 121° 19' E.*) the coast is generally low, and covered with trees, broken in parts by ridges from Wangka, a striking mountain 3,637 feet high, which has two summits and stands by itself; eastward of Wangka and near the coast is a remarkable rocky, rugged hill, the Liang, 827 feet high.

The 100-fathoms line runs about 3 miles from the coast, and just within is a long ridge of reefs; between this ridge and the coast reef is a channel which can be used with careful navigation. Pasir Rita is a large sandbank surrounded by a drying reef.

Between Tanjong Nbai and Lambo the coast is flat and fronted by a sand-strip; inland is the extensive plain of Lapeli, behind which can be seen the high mountains Ambu Rombu and Iné Rié, on the southern side of Flores. Through this plain flows the Nanga Koli, a comparatively large river, which forms a delta by Tanjong Nbai; southward of this delta, and close to the shore, is a small hill 135 feet high, by which is a hot spring.

Eastward of Tanjong Lambo the character of the coast changes, and becomes rocky, with mountains inland; several outstanding points form deep bays in between, which usually have a strip of marshy land at the head.

Todo bay affords moderately good anchorage, but is somewhat

General charts 942a, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 30' E.

obstructed by reefs, and the anchorage is difficult to reach; a steep, rocky islet lies in the middle of the entrance. The west point of the bay is conspicuous on account of the white limestone with which it is formed.

Chiendeh bay is more spacious than Todo bay, and although open to northerly winds, affords safe anchorage in both monsoons. Chiendeh island lies near the entrance.

Sopu bay (*Lat. 8° 32' S., Long. 121° 37' E.*) is sheltered from all winds except from the north-west, but the anchorage is very confined.

Paloë (Raja) island lies 8 miles to the north-eastward of Tanjong Lolakota, is about 4 miles in diameter, and rises to a height of 2,866 feet. It is steep-to on all sides, and can be approached with safety.

Anchorage.—From Tanjong Lolakota the coast trends in an easterly direction for 19 miles to Tanjong Batu Boga. In this part of the coast anchorage may be found in Lolakota bay, Maosandi bay, or Dondo bay. Eastward of Tanjong Batu Boga is a small inlet with anchorage about 5 cables, 154° true, from the eastern extreme of the point, in 40 fathoms.

Tanjong Batu Manuk is the termination of a high, bold promontory; eastward of the point the coast forms a bay, which is, however, very obstructed by reefs and foul ground, and the 100-fathoms line runs close outside them. Unjuran reef lies about 4 miles from the coast. Inland is a high mountain range rising to a height of 4,642 feet.

Maumeré bay.—The shore of this bay is mostly low and sandy, with a broad plain extending some distance inland; behind this, near the southern coast of Flores, is the Jelé ridge, a long range of hills 800 to 900 feet high, and probably the remains of an old gigantic crater. At the western end is Mount Dolowai, 3,138 feet high. The Dobo mountains consist of three round summits about the same height, the highest 2,657 feet, and to the eastward are two sharp summits close together, Mapi and Tara, which are joined by a deep saddle; to the southward is the volcano Egon, with a bare, reddish summit, 5,586 feet high.

Plan of Maumeré road on 2466.

Maumeré is a large town and the station of a Dutch posthouder; the Nanga Maumeré flows through the middle of it, but in the east monsoon is almost dry. At the eastern end of the town are two large trees standing just behind the road to Geliting, and to the

General charts 942a, 2759a.

Plan of Maumeré road on 2466. Var. 2° 30' E.

southward is Ili Getan, a hill 197 feet high. Off the town there is a break in the coast reef, thus forming a serviceable anchorage.

Supplies.—Provisions in small quantities can be obtained at Maumeré and Geliting.

Communication.—There is communication with Java, Makassar, Timor, and Sunda islands, about every four weeks by vessels of the Royal Dutch Packet Company.

Directions.—Approaching Maumeré road from the westward the southern side of Paloë island must be kept well open of Tanjong Batu Manuk, so as to pass northward of the Unjuran reef, which lies 4 miles from the coast. When past this reef steer for Mount Dobo, on the bearing 150° true, until Mount Dolowai is open of the western of the two large trees by Maumeré town, bearing 178° true, then steer on this line to the anchorage. Ili Gai in line with the western tree leads just clear of the coast reef to the north-westward of the anchorage.

Chart 942a, Eastern archipelago, eastern portion.

Breakers reported.—In 1911 breakers were reported about 8 miles westward of Pulo Besar in approximately Lat. 8° 27' S., Long. 122° 11' E.

Plan of Geliting road on 2466.

Anchorage.—From Maumeré to Geliting the coast is well populated, and there are several villages, Waiparé being the principal. Geliting is under an independent rajah, and drives a brisk trade. On the eastern side of the village is a conspicuous tree (Lat. 8° 38' S., Long. 122° 18' E.), which forms a good mark when entering the road. Vessels can anchor from 2 to 3½ cables from the shore, within the reefs, in 22 to 28 fathoms, mud bottom. The conspicuous tree in line with the western slope of the Dobo mountains, bearing 185° true, leads to the anchorage, and close eastward of a 5-fathoms rock.

Chart 942a, Eastern archipelago, eastern portion.

Coast.—From Tanjong Pogong the coast trends for about 9 miles to the eastward, and then turns to the northward to Tanjong Darat, forming, with the islands to the northward, Pedang, a deep, spacious bay, in which there are no outlying dangers. The coast is low, and mostly covered with trees; the land rises regularly to the hills behind, and a number of fresh-water streams flow through it.

Before the village Pedang, and in the inlet northward, anchorage may be had in 20 to 30 fathoms.

Tanjong Darat is low, but close behind the land rises to four conspicuous hills, the seaward one being covered with reeds and a few trees.

General charts 942a, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 30' E.

Pulo Besar, Dambilah, and Pangah Batang.—These islands lie close together, and were formerly known as the Great and Little Bastard islands.

Pulo Besar (Mangkuré) is high, steep, and wooded. On the north, west, and south sides a reef extends to about half a mile, but outside this is deep water. The island is inhabited, and there are numerous small villages on it; also deer. Fresh water can always be obtained from wells. The highest summit, 3,053 feet, is very conspicuous; to the south-eastward is a lower, flat summit. Southward of Besar are the two small Kabah islands.

Dambilah is peculiar in shape, hilly, and 718 feet high; to the northward of Parmahan, on which is a large fishing village, and to the north-westward of Parmahan is a large rock called Pulu Kondoh. South-eastward of Dambilah is Pangah Batang, with another large fishing settlement on it.

Between these islands and Besar are numerous rocks and reefs; Dambilah is joined to Besar by the coast reef.

Between Pangah Batang, the eastern island, and Tanjong Darat is a clear passage about half a mile broad. The summit of Babi island, bearing 27° true, leads almost through the middle of this strait; the coast reefs on either side are nearly always clearly visible.

Babi (*Lat. 8° 25' S., Long. 122° 31' E.*), formerly called East Bastard, is 1,150 feet high, and, except on the south side, where there is a low flat point, steep. It is surrounded by a coast reef which extends about 5 cables from the north-western point, but the 100-fathoms line runs close against the edge of the reef.

Pamana and Pamana kechil, formerly called the Doffer islands, lie close together, and are joined by reefs. Pamana only is inhabited, and has two summits, 334 and 328 feet high, with a sandy plain between. Pamana kechil is 246 feet high.

Anchorage.—The 100-fathoms line runs close round these islands, but on the southern side of Pamana is a small bay, where fairly secure anchorage may be found in 25 to 30 fathoms, about midway on the line joining the two points of the bay.

Gosong Boni.—About 2 miles to the south-westward of Pamana is an atoll with a depth in the lagoon of 47 fathoms; the lagoon has a diameter of about 7 cables, and can be entered through an opening in the reef on the eastern side about $1\frac{1}{2}$ cables broad.

Sukur island, 18 miles north-westward of Pamana, has a conspicuous summit, 865 feet high, on its north-eastern side, probably the remains of an old crater; on the western side the peak runs steeply down to a salt-water lake, about

General chart 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

450 yards in diameter, which is enclosed by a low ridge. On the western side of the island is a sand-strip, and about 2 cables off the eastern shore a rock with a single tree on it.

Pasir Lajaran (Angelica shoal) is an atoll about $3\frac{3}{4}$ miles in length in an east-south-easterly direction, and $2\frac{1}{4}$ miles in width. There is a protecting reef inside on which are dry places, also on the east and west extremes of the outer reef. It is everywhere steep-to, and can be distinguished by discoloured water. In the westerly lagoon, to which there is a passage through the reef to the northward, the greatest depth found was 33 fathoms.

Coast.—From Tanjong Darat the coast trends in a north-easterly direction to Tanjong Bela. Northward of Tanjong Darat is a broad valley, through which flows the Nanga Gète, the principal river in East Flores.

Tanjongs Watu Wulan and Bokan are high, bold points, but should not be approached nearer than 7 cables on account of the coast reef.

The only anchorage on this part of the coast is westward of the mouth of the Nanga Gète, in 20 to 30 fathoms, and about 2 cables from the shore.

Wai Prung bay affords good anchorage in the east monsoon, in about the middle of the bay, in 20 to 40 fathoms, and about $3\frac{1}{2}$ cables from the shore.

Hading bay is a deep, spacious bay, the coast of which is sparsely populated, the natives dwelling some distance from the shore. The bay is free from danger, but the depths are too great for anchoring except in the north-eastern part.

Tanjong Batu Payung (*Lat. 8° 14' S., Long. 122° 44' E.*), the south-western extreme of the peninsula to the northward of Hading bay, is somewhat low, and covered with trees; on the south-western side, close to the shore, is a rock in the form of a toadstool.

Flores head (Tanjong Kopondai) is a high steep promontory, especially on the eastern side, which is a bare rocky wall dropping almost perpendicularly into the sea.

Charts 941b, 942a, Eastern archipelago.

SOUTH COAST OF FLORES.—With the exception of the isthmus between Maumeré on the north side and Lela on the south side, the whole of the southern part of Flores is mountainous, and, in the eastern part especially, volcanic. The coast is steep-to, and there are no outlying dangers. Provisions are scarce, and can only be obtained in small quantities; in the dry season drinking water is difficult to find.

General chart 2759a.

Charts 941b, 942a, Eastern archipelago. Var. 1° 20' E.

Tides.—The tide on the south coast of Flores is mixed, with a strongly predominating double-daily character. The double-daily tide has springs fully $2\frac{1}{2}$ days after full and change with high water at XIIh. and a rise of $8\frac{1}{2}$ feet, increasing to $9\frac{1}{2}$ feet about the second half of March and September, and decreasing to $7\frac{1}{2}$ feet about the second half of July and December. Neaps fall the same interval after the quarters, with high water at VIh. and a rise of $2\frac{1}{2}$ feet, increasing to $3\frac{1}{2}$ feet, about the second half of June and December, and decreasing to $1\frac{1}{2}$ feet about the second half of March and September.

The single-daily tide has high water on 1st January, about VIIIh. p.m.; 1st April about IIh. p.m., 1st July about VIIIh. a.m., and 1st October about IIh. a.m. Spring tides occur about half a day after the moon's greatest monthly declination, with a rise of 3 feet; neaps the same interval after the moon's declination is 0° , with a rise of one foot.

The high and low waters of both groups cannot fall together.

The highest spring tide occurs about 1st May, at noon, and about 1st November, at midnight; the lowest about 1st February, at VIh. a.m., and 1st August, at VIh. p.m.

The highest level is reached when 0° moon's declination occurs two days after the quarters.

Except in the strait north of Toren island the tidal streams close under the coast never exceed $1\frac{1}{2}$ miles per hour.

Chart 1696, Lombok to Flores.

Toro Kerita (*Lat. $8^\circ 51' S.$, Long. $119^\circ 55' E.$*), the south-western point of Flores, appears as an island from eastward, and the 1,358 feet high summit can be easily distinguished; the coast here is almost perpendicular. Just to the eastward of Toro Kerita is a small bay, named Lehek Tekaka, with good anchorage in the west monsoon almost in the middle in 25 fathoms.

Nangalele bay.—Between Toro Kerita and Tanjong Repih the coast forms a wide, deep bay, named Nangalele bay, with the village and river of the same name on the north-eastern part. The appearance of the land here alters, and slopes up gradually inland; the coast is mostly a steep cliff about 70 feet high, fronted by a sand-strip.

The village Nangalele is about half a mile from the mouth of the river, and Tangi village is some 3 miles further inland.

Anchorage.—About half a mile eastward of Nanga Nisa anchorage may be found 3 to 5 cables from the shore, but there is little shelter here.

Mountains.—The Amarèdo and Sèso mountains are visible from the whole of Nangalele bay. The Amarèdo has three summits, the

General charts 941b, 942a, 2759a.

Chart 1696, Lombok to Flores. Var. 2° 20' E.

northern and highest reaching 4,469 feet. Sèso is a steep mountain, 3,578 feet high, and rises from the south-eastern slopes of Amaredo.

Toren island (Gelinta) is hilly, and rather bare; on the western part is the peculiar and conspicuous peak Ambu Aagah, with almost perpendicular sides, rising to a height of 1,919 feet. The island is almost entirely surrounded by a sandy beach, and in a few places a coast reef extends for about 3 cables. The southern point must not be approached nearer than half a mile. View at page 276.

Anchorage may be had off the north-western side, in 25 to 30 fathoms, with Ambu Aagah peak bearing about 173° true.

The channel between Toren island and Flores is free from danger, but a rather strong current runs.

Coast.—From Tanjong Lemu, at the eastern entrance to the strait, the coast trends to the eastward to Tanjong Watu Ipu, with a long bight in between. Near the sea the land is flat and covered with trees, but rises steeply behind. The villages Nangaramu and Mborong lie on this part of the coast; by the latter is a valley with a river flowing through.

Mountains.—To the northward of Tanjong Lemu are the Munti mountains, and to the north-eastward a high chain of mountains, of which Pocho Leok, 5,409 feet, is the highest summit. Behind this range is Pocho Likang, a round-topped mountain, 7,815 feet high. To the eastward of Mborong, standing alone, is Pocho Ndeki, with a round regular summit, 3,115 feet high.

Anchorage.—In the bight between Tanjongs Lemu and Watu Ipu it is everywhere very deep, the 100-fathoms line running at never more than 7 cables distance from the coast. In the small bay, where the village Nangaramu is situated, a vessel may anchor close to the reef, in 39 fathoms, with the two nearest points of land westward in line. Anchorage may also be found about 2 cables off the village Mborong, in 20 to 35 fathoms.

Plan of Aemere bay on 2466.

Aemere bay, about 6 miles wide, between Tanjongs Saukumeh (*Lat. 8° 53' S., Long. 120° 47' E.*) and Wai Waru, affords anchorage either off the Nanga Wai Moko, in the northern part of the bay, or off the settlement Aemere, in the north-eastern part, although, as in the whole of the south coast of Flores, there are great depths from a mile off-shore; off Aemere the depths are less and the landing place is considerably better, especially in the south-east monsoon.

The western side of the bay is steep and rocky, rising to the mountains Kombah and Lumu; on the northern side the land ascends

General charts 941b, 942a, 2759a.

• *Plan of Aemere bay on 2466. Var. 2° 20' E.*

gradually, and is extremely fertile. On the eastern side is a long chain of mountains, commencing far inland, the principal of which are Lobu Butu, a saddle mountain; Watu Ata, a sharp peak, 5,315 feet high; Watu Atagaë, another saddle mountain, 5,517 feet high; and the steep, rocky, Langa mountains, with three summits. To the southward of the latter, and separated by a valley, is the very regular conical volcano Iné Rié, the most conspicuous landmark in the south of Flores.

Chart 942a, Eastern archipelago, eastern portion.

Coast.—From Tanjong Wai Waru the coast runs round the foot of Iné Rié to Ngaru Beré, the southern point of Flores, and thence eastward to Ngaru Dai, forming a bight with steep mountain land behind; Ambu Rombu (Keo), about 7,053 feet high, with its wide crater and broad bare summit, stands out clearly.

Ende bay, the largest bay on the south coast, is mostly surrounded by hilly land, the higher mountains lying somewhat further inland. On the south-western side of the bay, rising steeply from the sea, are the Ngaru Tangi mountains, and to the northward the saddle mountain Keri Doa; from the eastern part of the bay Ambu Rombu can be seen in the background between these two. In the limestone formation of the north coast of the bay are many caves and hollows, with some noticeable white and grey patches.

Nusa Ende, lying near the middle of the bay, has two summits joined by a narrow ridge, forming a small bay on each side; the southern and highest summit attains a height of 1,549 feet, and provides a good mark. The island is well cultivated, and has many villages; fairly good anchorage may be found in the western bay, off the village Mando. The coast reef extends in parts here to about 3 cables.

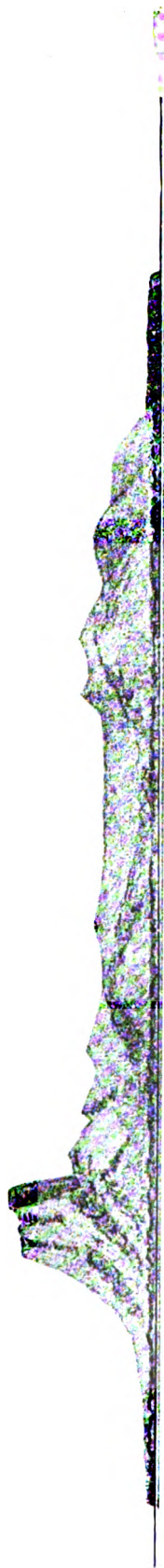
Plan of Ende and Ipi roads on 2466.

Ende (Lat. 8° 50' S., Long. 121° 39' E.), the station of a Dutch civil authority, is situated on a plain on Ija peninsula, which separates Ende and Ipi bays. In the southern part of this peninsula is the active volcano Ija, 2,161 feet high, covered with sulphur and ashes from frequent eruptions, and with the active crater on the southern side. Close northward of Ende are three conspicuous hills, Kerimana, 896 feet high, with a sharp summit, and standing on the shore; Kingo, 1,521 feet high; and Wongé, 2,136 feet high.

The anchorage before Ende is in 30 to 36 fathoms, from 2 to 3 cables from the shore, but vessels lie very much better in Ipi bay.

Communication.—Vessels of the Royal Netherlands Steam
General charts 941b, 942a, 2759a.

E. summit, bearing 24° true, 6 m.



Amba Agah peak.

Flores, south coast; Toren island.

Mt. Kron, bearing 169° true, 4 m.



Tanjong Waindi.

Mt. Lena.

Sumba, north coast, from Palmedo road.

Loku Palmedo.



Tanjong Ngunju, bearing 265° true.

Sumba, south coast; Tanjong Ngunju.

Plan of Ende and Ipi roads on 2466. Var. 2° 30' E.

Packet Company, on the Surabaya, Sunda islands, Timor route, call at Ende every four weeks, both going and coming. Also every four weeks on the Java, Makassar, Sunda islands, Timor route. In the latter Aemere is also visited.

Ipi bay, on the eastern side of Ija peninsula, forms a secure anchorage during the west monsoon, and there is a good road across the peninsula to Ende. On the western side of the bay is Pui, a hill 1,290 feet high; northward of this the land is flat, and the coast fronted with a sandy beach, at the commencement of which is the village Ipi and a row of conspicuous trees. The island Kowa lies in the northern part of the bay.

The best anchorage is off Ipi village, with the fifth or northern of the above-mentioned trees in line with Kerimana hill, and a tree-covered point to the southward in line with the south point of the bay, bearing 185° true. A vessel will lie here in about 30 fathoms, 2½ cables from the shore, but it must be borne in mind that northward of this anchorage the coast reef extends a little.

Chart 942a, Eastern archipelago, eastern portion.

Coast.—Eastward of Ipi bay the coast is high and precipitous, the termination of sharp mountain ridges extending from the remains of a volcano whose slopes are under cultivation; to the north-eastward is Lapi Doro, 5,680 feet high. By Loö Ronga the coast curves to the north-eastward, forming a bight named Mbuli bay, in which, however, is no sheltered anchorage. At the back of this bight the high mountain land retreats to the interior, leaving a broad, well-cultivated, thickly populated strip of land.

Ngaru Dorie is the eastern point of Mbuli bay, and is formed by the dome-shaped hill Risé, which rises to a height of 2,312 feet; the point itself is of a reddish colour.

Paga bay.—On the western side of this bay, and about one mile to the eastward of Tanjong Ulu Wiro, are the two large villages Mau Loö and Paga; before these villages a coral reef extends for about 5 cables. On the northern side of the bay is the village Lela (*Lat. 8° 43' S., Long. 122° 10' E.*), which consists of a few native houses and the buildings of the Roman Catholic Mission, which are situated a little distance inland. A good road runs from here to the north coast of Flores, and Maumeré can be reached by four or five hours' walking.

The depths in the middle and western part of Paga bay are moderate, but increase in the eastern part off Lela, although anchorage may be had off this village in about 32 fathoms.

General charts 942a, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

Sika besar.—By Sika besar, at the east point of Paga bay, the coast turns to the eastward and forms here a long flat point with the mountains rising almost immediately behind. On this small plain is situated the village and Roman Catholic church; the spire and zinc roof of the church can be seen from a considerable distance. A reef extends for about 2 cables off the point. The best anchorage, which is however entirely open, is with the church bearing about 2° true, and about 3 cables from the shore. The landing place is to the eastward of the point by a number of sheds under which large praus lie. A road runs from Sika besar to Lela, and there is regular communication with Maumeré.

Coast.—Immediately eastward of Sika besar the mountains rise precipitously from the sea, forming a steep inaccessible coast, with the 100-fathoms line running about 2 cables from the shore. Ngaru Baluk is a steep rock about 260 feet high, behind are the Jelé mountains, the northern side of a formerly large crater, broken down on the south side, and which contains a cone of ashes. Eastward of Ngaru Baluk the land ascends gradually to the Dobo mountains. Ngaru Kelahi, 15½ miles eastward of Ngaru Baluk, is the extremity of a steep mountain ridge, and can be recognised from seaward by two perpendicular white rocks, one above the other.

Ngaru Kuwar, 6 miles further eastward, is the extremity of a ridge from the steep Karkonata mountains; off the point, and separated by a narrow cleft, is a rock in the form of a sugar loaf, and on the eastern side of the point is a very conspicuous white patch divided in two by a black vertical stripe.

On the south-eastern point of Flores are the Lobetobi mountains, two active volcanoes, the higher being 5,589 feet high.

EAST COAST OF FLORES.—**Tanjong Karangwutun** (*Lat. 8° 9' S., Long. 122° 58' E.*) is a low point covered with trees; the coast reef extends here for a distance of half a mile, with two sandbanks on it which dry at low water. About 4 miles southward of Tanjong Karangwutun is a small bay, named Mulubahan, which is, however, almost entirely obstructed by reefs. From the inner end of this bay to Hading bay the isthmus is only one mile wide.

Tanjong Matangdoë is the western point of the northern entrance to the narrows of Flores strait; a coast reef extends from it for a distance of 6 cables, and to the northward and half a mile from the coast is a reef of 3 fathoms water.

Serbete island, 3 miles eastward of Tanjong Karangwutun, lies on the western side of the northern entrance to Flores strait, and is 85 feet high. It is surrounded by an extensive reef, extending to the

General chart 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

eastward for $1\frac{1}{2}$ miles, which partly dries at very low water in April and November. On this reef are two sandbanks, the eastern one always shows above water, and is on the edge of the reef; coming from westward it gives one the impression of being under the Adunara coast.

The channel westward of Serbete is clear and deep. Ili Mandiri peak, 4,925 feet high, to the southward, is a useful landmark for this passage.

Plan of Larantuka road on 2466.

Larantuka lies at the foot of the Ili Mandiri, and is the seat of government of East Flores and the Solor islands. The head-quarters of the Roman Catholic Mission are also established here, with dwellings for the priests, schools, church, and a nunnery. The remains of an old Portuguese fort lie near the shore.

The anchorage in the road is in 11 to 12 fathoms, sand and stones, about $1\frac{1}{4}$ cables from the shore, with the fort bearing 317° true. The current, which is very strong in the narrows, is little felt here, and seldom exceeds a mile an hour.

Supplies in small quantities can be obtained, and good drinking water.

Communication.—Vessels of the Royal Dutch Packet Company call at Larantuka in alternate months, outward and back, on the Java, Makassar, Sunda islands, Timor route.

Chart 942a, Eastern archipelago, eastern portion.

Wai Balon bay.—Southward of Larantuka the coast forms two deep bays, Wai Balon and Konga, separated by a high outstanding point descending from Mount Kabalelo. In Wai Balon bay, the northern, there is good anchorage in 10 to 20 fathoms, westward of the island Wai Balon, at about 3 to 4 cables from the shore. A path runs from here to Hading bay over the saddle between Hedaka and Padung mountains.

Plan of Konga bay on 2466.

Konga bay affords secure anchorage in the upper part, where the depths are moderate, and there are no dangers except near the coast. Konga island, 876 feet high, is covered with bushes, and can be seen from Wai Prung bay (north coast of Flores) over the low land lying between these bays. Opposite this island is the village Konga (Lat. $8^\circ 26' S.$, Long. $122^\circ 47' E.$).

Chart 942a, Eastern archipelago, eastern portion.

FLORES STRAIT, between the east coast of that island and the west coasts of Solor and Adunara, is very variable in breadth, but

General charts 942a, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

is deep throughout, and almost free from dangers. The northern part of the strait is generally called Larantuka narrows; by Tanjong Gonsalve, the narrowest part, the width is about $3\frac{1}{2}$ cables, and between the 10-fathoms lines on either side, about 2 cables. From Tanjong Matangdoë the coast reef extends for about 6 cables, and also on the opposite side of the strait, from Tanjong Pasir, the coast reef extends somewhat; a little to the southward, off the village Wuri, on Adunara island, is a reef with $1\frac{1}{4}$ fathoms over it at about 3 cables from the shore. These dangers are easily avoided, but owing to the very strong current, the passage of the narrows is impracticable for vessels of small engine power, and for large ships great care is required. View at page 284.

The southern part of Flores strait, called Lewotobi strait, is clear and deep, with a least breadth of $1\frac{7}{10}$ miles.

Kambing island.—Off the southern entrance to Lewotobi strait are four rocky islands. Kambing (*Lat. 8° 41' S., Long. 122° 51' E.*), the southern and largest, is 446 feet high and steep-to, on the south-eastern side is a small ridge of rocks. Nuha Lobetobi, nearly $2\frac{1}{2}$ miles to the northward, is 148 feet high. Laling and Lowowuran are merely high rocks; 3 cables to the south-eastward of Laling is a rock awash at low water.

Eastward of Kambing, and $1\frac{1}{2}$ miles from the Solor coast, is a sharp pointed rock, the Nuha Watu, with two small rocks close to it.

Tides.—The tide in Flores strait is mixed, with a preponderating double-daily character; the water reaches the lowest level in April and November.

According to observations by the Dutch surveying vessel *Van Doorn*, the stream in the narrows sets to the northward about one hour after the rising and setting of the moon, the stream to the southward 6 hours later. Slack water, especially during springs, is of very short duration. The maximum velocity of the stream is 2 to 3 days after full and change, with a speed of 9 miles per hour; the minimum is 2 to 3 days after the quarters, with a speed of 3 miles per hour.

Directions for Flores strait.—Entering Flores strait from northward the two opposite points of Larantuka narrows in line, bearing 204° true, or the narrows just open, will clear the reef off Tanjong Matangdoë and the reefs off Wuri village (Adunara). When Wuri church bears 114° true steer more to the southward for mid-channel. Further directions are unnecessary, the chart being sufficient guide.

SOLOR ISLANDS, consisting of the islands Adunara, Solor, and Lomblem, belong to the Residency of Timor, and are well populated. The Dutch Government is represented by the Civil Authority at Larantuka, under the Assistant Resident of Flores. The native

General chart 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

government is vague, and of little importance. The coast inhabitants are Mohammedans, with a few Christians, and make their living by trade, agriculture, and fishing. The hill tribes are heathen, and live entirely by land cultivation; as they appear to be under no recognised authority there are endless strifes between them.

West coast of Adunara.—From Saganji Wutun (*Lat. 8° 14' S., Long. 123° 9' E.*) to Tanjong Gonsalve the coast is generally low, wooded, and with occasional sandy beaches, the land behind rising gradually to the central mountains. Immediately westward of the first point is the village Adunara, situated on the top of a steep rock and conspicuous by the zinc roof of the mosque. Nearly 2 miles to the north-eastward of Tanjong Gonsalve is the village Wuri, which may be recognised by the church; southward of this point the coast becomes steeper, terminating in Tanjong Wotang, with the hill of the same name, 1,700 feet high, above the point.

Anchorage in 30 fathoms may be had off Adunara, with Saganji Wutun bearing 75° true, and the village in line with Mount Kuma.

Mountains.—Mount Boling, in the south-eastern part of Adunara, is a regular-shaped, extinct volcano, 5,443 feet high. Mount Kuma, nearly in the middle of the island, has a sharp summit 2,680 feet high. Mount Saburi, to the westward, attains a height of 3,248 feet.

West coast of Solor.—Seen from Flores strait, Solor island consists of two groups of mountains, with a low plateau sparsely covered with palm trees between. The northern group, the Keriwatu mountains, attain a height of 2,920 feet; the southern group consists of the Riang Belahan, 1,430 feet high, and Berapun, 2,313 feet high.

Tanjong Lewalingi, the south-western point of Solor, rises almost perpendicularly to a height of 390 feet, and is very conspicuous owing to the red colour of the rock.

South coast of Adunara.—Wera Wutun, nearly 4 miles eastward of Tanjong Wotang, is a low, wooded, conspicuous point, with a small stream flowing out near it; between these points the coast curves in, forming several small bays. From Wera Wutun the coast runs in an easterly direction to Tanjong Watu Woko, the south-eastern point of Adunara, with Rihe Wutun, Warang Wutun, and Ana Buraka Wutun between; the latter point may be recognised by a ridge of black rocks extending from it. Along this part of the coast are several market places, each with their special market day.

Solor strait, between Adunara and Solor, is generally used by vessels passing through Flores strait when bound for Timor. With the exception of a reef of 2 fathoms, extending half a mile from the

General chart 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

north-eastern point of Solor, it is entirely free from danger, with deep water throughout.

In traversing this strait sailing vessels will find it preferable to keep on the Solor side, as the squalls are not so frequent, Solor being lower than Adunara, though the deeper water affords less opportunity of anchoring.

Currents.—During the few days spent in the Dutch survey of Solor strait it was observed that the flood stream set to east, the ebb to the west, never attaining a greater velocity than $1\frac{1}{2}$ miles per hour, and seldom more than one mile. The direction of the stream is governed by the streams setting at that time in the adjacent straits Flores, Boling, and Lamakera, also by the tide in these straits.

The tide is mixed, with a predominating double-daily character.

North coast of Solor.—Kalika Wutun, the north-western point of Solor, is steep and rocky; eastward of the point are the fairly large villages Lewonama and Pamakaju. Between Pamakaju Wutun and Lewokaha Wutun the coast curves in with the valley between Keriwatu and Lewu-ung mountains behind.

The entire north coast of Solor consists of sand and stony ground dotted with trees, and in contrast to the Adunara coast, is very unfertile.

Tanjong Kebon, at the eastern entrance to Solor strait, ends steeply with an overhanging cliff—resembling the sail of a ship. Eastward of the point, half a mile off-shore, is a long ridge, with 2 fathoms water over it, and depths of 3 to 6 fathoms between it and the coast.

Anchorage.—Very good anchorage will be found in the bay between Pamakaju Wutun and Lewokaha Wutun, with a small rocky point at the head of the bight bearing 149° true; at 3 cables from this point the depth is 30 fathoms, and one cable nearer the shore, 15 fathoms.

Off the village Lewahajong, where the Rajah of the district resides, there is anchorage in 25 fathoms $2\frac{1}{4}$ cables from the shore, northward of the remains of an old Portuguese fort.

North coast of Adunara.—Horrong wutun, 3 miles eastward of Saganji wutun, rises almost perpendicularly out of the sea; between these points is a bay greatly obstructed with reefs.

Plan of Sagu bay on 2468.

Sagu bay affords the best anchorage on the north coast of Adunara. Sagu village (*Lat. $8^\circ 14' S.$, Long. $123^\circ 13' E.$*), on the south-western shore of the bay, is conspicuous by the Rajah's house, built of stone, with a zinc roof and flagstaff in front. At the head of the bay is a white stone pyramid.

A patch, with $3\frac{1}{4}$ fathoms water, lies 6 cables north-north-westward of Tanjong Watu Koli, and there are patches of 5 and 4 fathoms further north-eastward.

General charts 942a, 2759a.

Plan of Sagu bay on 2468. Var. 2° 40' E.

From the eastern side a reef extends for a distance of 3 cables, with a least depth of $2\frac{1}{2}$ fathoms over it; southward of this are two patches of $1\frac{1}{4}$ fathoms and 3 feet. In the south-western part is a reef of 2 fathoms, and in the entrance 8 cables eastward of Sagu wutun, a shoal of $3\frac{1}{4}$ fathoms.

Anchorage may be had in 24 fathoms, over sand, with Koli Kedeh wutun bearing 62° true, and the white stone pyramid 176° true. The latter bearing leads into the bay clear between the reefs.

Chart 942a, Eastern archipelago, eastern portion.

From Koli Kedeh wutun, the eastern point of Sagu bay, the coast trends in an east-south-easterly direction for 6 miles to Tanjong Wur Gobin, the north-eastern point of Adunara. Nearly midway between these points are three small islets under the coast; Bani, the largest, is 253 feet high, Merah is a red rock, and Muku lies immediately westward of Tanjong Wulu Wata. About one mile westward of Tanjong Wur Gobin is the village Mokko, built on piles standing in about one fathom water.

This part of the coast is fronted by an almost continuous line of islets and reefs, with a clear passage inside affording good anchorage. Watu Peni, 108 feet high, and Kroko, lie together on a large drying reef; Kenaweh and Ipet on another reef to the south-westward, with a narrow navigable passage of 10 fathoms between them and the main island.

East coast of Adunara to Deri wutun, a distance of 5 miles, is low, and rises gradually to the mountains inland; southward of this it is closely populated, with numerous palm trees and sandy beaches.

South-east coast of Solor.—Lamakera village, just westward of Tanjong Mottong (*Lat. $8^\circ 26'$ S., Long. $123^\circ 10'$ E.*), is conspicuous by the red roof of the mosque and the Rajah's flagstaff. There is good anchorage off the village outside the 3-fathoms line. Westward of Tanjong Tobi, 7 miles south-westward of Tanjong Mottong, the coast forms a bight, with a sand-strip at the back, and then turns to the southward to Samatanji wutun. There is good anchorage anywhere along this part of the coast, but southward of the latter point the 100-fathoms line runs from one to half a mile from the shore.

Boling and Lamakera straits provide a spacious, deep, and almost entirely clear passage between Adunara and Solor on the west side, and Lomblem on the east side. View at page 284.

The straits are very open to sea and swell, and there is usually a stiff breeze, especially in the latter half of October and the months of

General charts 942a, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

November and December, when the prevailing wind is from the south-west.

The width in the northern part of Boling strait is considerably reduced by the partly drying reefs on either side, but these can generally be clearly seen by discoloured water, and the centre of the channel for a least breadth of 8 cables is clear and deep.

In about the middle of Lamakera strait, 3 miles eastward of the eastern point of Solor, is a large reef with a least depth of $5\frac{1}{2}$ fathoms over it. Eastward of this, and close under the Lomblem coast is a reef of 3 fathoms, with another reef of coral and stones with 7 fathoms water $1\frac{1}{2}$ miles to the northward.

Tidal streams.—In Boling strait the flood sets to the north-eastward, the ebb to the south-westward; these commence about 2 to 3 hours before and after high water, and at springs attain a velocity of 5 to 6 miles an hour. The strongest current is in the narrows close under the south-eastern point of Adunara.

West coast of Lomblem.—Leba Leba bay, $5\frac{1}{2}$ miles wide at the entrance between Tanjongs Tuak (*Lat. 8° 18' S., Long. 123° 21' E.*) and Lowukuma, and 8 miles deep, has moderate depths, and affords anchorage almost anywhere. The northern side of the bay is formed by a low narrow peninsula, the eastern part of which rises gradually to Mount Lewotolo; in the western part is a hill 492 feet high, which appears as an island from Lamakera strait. In the southern part of the bay, about one mile eastward of Tanjong Wai Wowang, is the Awalolong reef, which dries at low water; there is good anchorage eastward of this reef, in 8 to 10 fathoms.

From Tanjong Lowukuma the coast trends in a south-westerly direction for 10 miles, to Tanjong Liang Meah, the northern extreme of a steep, waste mountain land that forms the south-western point of Lomblem. In the northern part of this ridge are two summits, named Lama Imu, 1,683 and 1,919 feet high. To the eastward are the Mingar mountains, attaining a height of 3,346 feet.

South coast of Lomblem.—Soangi islet, 180 feet high, lies one mile to the southward of Tanjong Suba, with a clear passage between, through which a strong stream runs during springs; three-quarters of a cable off the north-western point is a rock awash at low water.

Telok Atu, the small bay eastward of Tanjong Suba, has regular depths in it of 6 to 9 fathoms, so that anchorage may be obtained, well sheltered in the west monsoon. Under the coast on the east side of the bay is a conspicuous group of black rocks.

Telok Atawai, between Tanjongs Konga and Beloppo, is a fairly

General chart 2759a.

Kerivatu. *Ni Mandiri, bearing 237° true, 8 m.*

Mt. Boling.



Flores strait.

Flores strait, north entrance.

Boling.

Mt. Lovololo.



Mt. Lamararap.

S.E. point Lombem.

Songgi.

Mt. Amutong.

Lamakera strait, S.W. point Lombem, bearing 10° true, 18 m.

Lamakera strait, south entrance.

Reta.



W. point Ombai

Panjang, bearing 182° true.

Pura Besar.

E. point Pantar.

Pantar strait, north entrance.

Chart 942a, Eastern archipelago, eastern portion. Var. $2^{\circ} 40' E$.

deep inlet; anchorage in 20 to 30 fathoms may be obtained about 2 cables from the west and northern shores.

Wolowutun, the southern point of Lomblem, is formed by a long sharp ridge from Mount Lamararap, which ends in a narrow plateau rising steeply out of the sea to a height of 121 feet. The village Lamararap is $1\frac{1}{2}$ miles eastward of the point.

Labala bay, with the village of the same name in the northern part, and the residence of the Rajah of the south and east coast of Lomblem, is entirely surrounded by high mountain land. The most conspicuous of these is Mount Lamararap, with a sharp summit, 5,394 feet high, on the western side of the bay. On the northern side are Bogé, with three summits, the highest being 3,291 feet; Rodan, 3,268 feet; and Ili Beloppo, 2,917 feet, with a regular, dome-shaped summit. On the eastern side are Lapangona and Lamanunah, 3,169 and 2,874 feet, respectively.

Anchorage.—There is anchorage off Labala village in 24 fathoms, mud and sand, about $1\frac{1}{2}$ cables from the shore, with the flagstaff bearing 310° true, and Lewo Wutun (a low, cliffy point westward of the village), 248° true.

North coast of Lomblem.—Between Tanjong Wai Au (*Lat. $8^{\circ} 15' S.$, Long. $123^{\circ} 25' E.$*), at the entrance of Boling strait, and Mawa Wutun the coast forms a wide bay, divided in two parts by Munu Wutun, a conspicuous point with white perpendicular cliffs. The western part is entirely obstructed by reefs, in the eastern part is the fairly large village Lewobéla, off which anchorage may be obtained on a shallow ridge.

Telok Lewaling, a large bay extending nearly 13 miles inland, affords good sheltered anchorage in both monsoons. On the eastern side of the bay, dividing it into two portions, is the peninsula Neira; the northern of these is named Telok Lewaling, and the southern Telok Wai Hinga. In the south-western part of the latter, where the coast reef is more pronounced, are several rocks close under the coast, and 6 cables eastward of Lamariang Wutun is a reef of 5 fathoms.

Anchorage.—Before the village Lewaling, on the eastern side of the bay, there is fairly good anchorage in the east monsoon, in about 20 fathoms, with the village bearing 90° true about 2 cables from the shore. There is also anchorage in 20 to 28 fathoms on the northern side of the isthmus of Neira.

In Telok Wai Hinga there is very good anchorage in the southern part, off Pasar Hadakéwa, in 20 to 25 fathoms, 4 cables from the shore.

Telok Balurin, separated from Telok Lewaling by an uninhabited peninsula, is of little importance, as there are few inhabitants, and the depths in the greater part of the bay prohibit anchorage.

General chart 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

Mountains.—Lewotolo, 4,757 feet high, is an active volcano on the western side of Telok Lewaling. Kedang, eastward of Telok Balurin, is 5,030 feet high.

Komba island (Batu Tara) (*Lat. 7° 47' S., Long. 123° 36' E.*) is an excellent guide for Flores and Boling straits for ships coming from northward. It is about 4 miles in length, with an active volcano in the southern part, 2,453 feet high; it may be safely passed at 2 cables distance on all sides.

Chart 941b, Eastern archipelago, western portion. Var. 2° 10' E.

SUMBA or SANDALWOOD ISLAND is about 110 miles in length in an east-south-easterly direction, and about 40 miles in greatest width. Except on the southern side, where it is high and steep, it is mostly low and flat along the coast; the mountains, which nowhere attain an important height, being some distance inland. The highest mountains, the Massu range, are 4,019 feet high. A number of rivers flow into the sea from the mountains, but except for the Kambura, which discharges into Nangamessi bay, on the northern side of the island, are of little importance save for irrigation purposes.

The inhabitants are of Malay origin, though distinct in race and language from those of the nearest islands; they grow rice, maize, and other crops. The island is considered to have the best and largest breed of horses in the Archipelago; these, with sandalwood, wax, and edible birds' nests, form the chief articles of export. The island forms one of the divisions of the Timor Residency, and is subdivided into three districts, viz., Melalo or East Sumba, Waingapu or Mid Sumba, and Memboro or West Sumba. A contrôleur is established at Waingapu, and a posthouder at each of the other two divisions.

Climate.—The average height of the thermometer in Sumba island, at 6 a.m., is 77° Fah.; from mid-day to 3 p.m., 89° Fah.; and at 6 p.m., 84° Fah. November is the hottest month, the temperature then frequently reaches 95° Fah.; from the middle of June to August the nights are very cold, and the temperature seldom exceeds 60° Fah.

In February, during the west monsoon, the rivers become very swollen; from May to October it seldom rains near Waingapu, and the land in this district becomes very dry and withered.

The climate of Sumba is very healthy, and there is little sickness amongst the population.

NORTH COAST OF SUMBA.—From Tanjong Karosso, the western point of Sumba, the coast trends in a north-easterly direction to Tanjong Waiwala, then turns to the eastward to Palmedo road, and thence north-eastward again to Tanjong Sasar, the northern point of the island.

General chart 2759a.

Chart 941b, Eastern archipelago, western portion. Var. 2° 10' E.

Eastward of Tanjong Karosso, and about 2½ miles inland, is Atedalo, a dark tree on a hilly ridge; on the coast to the northward are the villages Waikasaka, Waitelaro, and Suma.

Chart 1696, Lombok to Flores.

Waikelo bay, between Tanjongs Waiwala and Oro, affords anchorage in 40 fathoms; the landing place is eastward of the river mouth.

Tanjong Nanga Amba is low and covered with trees, Tanjong Kerendi low and sandy; between these points is the mouth of the Loku Ketewil, with the village of the same name, and inland the village Totoka on the summit of a hill 1,450 feet high.

Chart 941b, Eastern archipelago, western portion.

Mountains.—Zadelberg (Saddle mountain), to the southward of Tanjong Waiwala, is a good mark from seaward; the north-western and highest summit is 1,673 feet high. Mount Wajewa, 2,450 feet high, has a conical summit; close to the eastward is Talariu, 2,723 feet high. Southward of Palmedo road is Mount Lena, 1,302 feet high, and Bolabokat, a village on the summit of a hill, 2,095 feet high.

Plan of Memboro road on 2468.

Memboro road.—The village Memboro (*Lat. 9° 22' S., Long. 119° 33' E.*) is situated on a rivulet in the bight between the rocky Tanjong Batumbaba and the low sandy Tanjong Laramanipa. The house of the Dutch Government official is on a small height near the village. There is anchorage off the village in 15 fathoms, sand; landing is generally easy, provided one pays attention to the surf off the mouth of the rivulet. The limits of the road are between the bearings 304° and 11° true from the flagstaff, and the line joining Tanjongs Batumbaba and Laramanipa.

Plan of Palmedo road on 2468.

Palmedo road.—Close westward of Tanjong Palmedo is the mouth of the Loku Palmedo, which is greatly obstructed by a sand-bar almost drying at low water springs. The river flows through a broad cultivated valley bounded on either side by high ridges, and in which are several villages. The small coast village Palmedo lies on the eastern bank. View at page 276.

The best anchorage is in 17 fathoms, sand and stones, with Mount Lena bearing 165° true. The stream here attains a greatest velocity of 2½ miles an hour.

Tides.—It is high water, full and change, at XIh.; springs rise about 15 feet.

Chart 1696, Lombok to Flores.

Tanjong Sasar, the north point of Sumba island, is steep on the western side, rising perpendicularly to a height of 100 to 130 feet, and is the termination of a high ridge, named Datu Sasar, which extends for about 6 miles to the southward.

General charts 941b, 942a, 2759a.

Chart 941b, Eastern archipelago, western portion. Var. 2° 20' E.

NORTH-EAST COAST OF SUMBA.—The land behind this part of the coast has few distinctive points, and rises generally in terraces with fine grassy plains, on which large numbers of horses graze. The coast is mostly fronted by a sand-strip.

Tanjong Ngaru Ruhu.—From Tanjong Sasar the coast trends in a south-easterly direction to Ngaru Ruhu, where the tableland behind ends abruptly in a perpendicular wall, at the foot of which is a sandy flat about 2 cables broad. Between Tanjongs Roda and Ngaru Ruhu the depths off-shore are regular, and anchorage may be had anywhere. The village Kapunduk, situated on a hilly ridge with a white spot on the seaward slope, is conspicuous.

Eastward of this village, and nearly half a mile from the shore, are two reefs, the western one of which dries, and the eastern has one fathom water over it.

Nangamessi bay is about 19 miles wide between Tanjongs Ngaru Ruhu and Batu Ata (*Lat. 9° 37' S., Long. 120° 28' E.*). On the western side the tableland comes close to the coast, retreating further inland to the southward by Tanjong Tai Manuk, where the coast flat is about 2 miles wide; on the edge of the ridge northward of this point is a conspicuous white spot, and westward two deep ravines, with Mount Data, 1,634 feet high, rising between. Between Batu Ata and Tanjong Chumba, 5 miles to the westward, the coast is wooded; by the latter point are two small islets on the drying coast reef.

Anchorage.—The depths in Nangamessi bay are very irregular, and it is open to northerly and easterly winds. On the west side of the bay there is anchorage in 20 to 25 fathoms off the white spot on the ridge mentioned above; on the south side, in Waingapu road and Telok Kambaniru, or between these inlets, in 25 to 30 fathoms, close to the coast reef.

Plan of Waingapu road on 2468.

Waingapu road, in a small inlet in the south-western corner of Nangamessi bay, affords secure but confined anchorage, and in both monsoons vessels can lie here free from swell and sea. Tanjong Tai Manuk is the western entrance point, and Kabarú village, just within it, is the seat of the Rajah of that district. The southern part of the inlet is divided into two arms by a projecting point. On the eastern side of the inlet is Waingapu, which has advanced considerably in latter years and carries on a brisk trade with Makassar, Melolo, and Buton; the exports are horses, sandalwood, skins, shells, birds' nests, and a little copra. A contrôleur and posthouder are stationed here. From the road a large white house with red roof is conspicuous, also the black sheds with zinc roof of the Royal Dutch Packet Company.

General charts 941b, 942a, 2759a.

Plan of Waingapu road on 2468. Var. 2° 20' E.

Reefs and beacons.—The following dangers and beacons exist in Waingapu road: A reef, with a depth of $1\frac{1}{2}$ fathoms over it, at $10\frac{3}{4}$ cables, 348° true, from the northern pyramid on the projecting point in the inlet, marked by a beacon with white ball topmark. At $1\frac{1}{2}$ cables further in the same direction is a rock with 6 feet water. A reef with 5 fathoms water over it lies $2\frac{1}{4}$ cables, 82° true, from the beacon.

A beacon, with white ball topmark, marks the edge of the reef on the western side of the inlet, and a similar beacon marks the northern edge of the reef extending from the projecting point; a beacon with black truncated cone topmark marks the edge of the reef on the eastern side of the inlet.

Two pyramidal beacons, 450 yards apart, which, in line on the bearing 188° true, lead to the anchorage, are erected on the projecting point in the inlet.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call every four weeks at Waingapu, on the Surabaya, Sunda islands, Timor route. Also every four weeks on the Java, Makassar, Sunda islands, Timor route.

Supplies.—Provisions in moderate quantities can be obtained, and good water from wells.

Anchorage (*Lat. $9^\circ 38'$ S., Long. $120^\circ 16'$ E.*). — The best anchorage is in 18 fathoms, mud and sand, with the two pyramids in line, bearing 188° true, and Tanjong Atu, 105° true. This position is about one cable from the reefs on either side. Small vessels can anchor at the entrances to the arms of the bay.

In the outer road there is good anchorage, in 19 fathoms, near the 5-fathoms reef, a little to the westward of the pyramids in line, with the northern pyramid bearing 182° true, and the low wooded point Himbu Baku, 115° true.

Tides.—The tide in Waingapu has a very predominating double-daily character.

The double-daily tide has springs $2\frac{1}{2}$ days after full and change, with high water at XIIh., and a rise of 9 feet; neaps at the same interval after the quarters, with high water at VIh., and a rise of 2 feet.

The single-daily tide gives high water on 1st January, about VIIh. p.m.; 1st April, about Ih. p.m.; 1st July, about VIIh. a.m.; and 1st October, about Ih. a.m.; springs occur one day after the moon's greatest declination, with a rise of $2\frac{1}{2}$ feet; neaps the same interval after 0° moon's declination, with an inappreciable range.

General charts 941b, 942a, 2759a.

Plan of Waingapu road on 2468. Var. 2° 20' E.

The high and low waters of both groups cannot fall together.

The highest spring tide is about the middle of April, at mid-day, and the middle of October, at midnight; the lowest about the middle of January, at VIh. a.m., and the middle of July, at VIh. p.m.

Chart 941b, Eastern archipelago, western portion.

Telok Kambaniru.—The depths in this small bay are also very irregular, but there is good anchorage, in about 24 fathoms, before the mouth of the Kwala Kambara, and sailing vessels of the traders make frequent use of it. Kwala Kambara, the principal river of Sumba, flows into the bay, but the mouth is greatly obstructed by sandbanks, which almost dry at low water. About a mile up the river is the village Kambaniru, with a mission house.

Coast.—From Tanjong Batu Ata the coast trends in a south-easterly direction for 25 miles, to Tanjong Wara Janga, and is almost entirely fronted by a sand-strip with trees behind, the hills rising in flat terraces further inland. Between Tanjongs Batu Ata and Tuak are two bights, into which flow the Kwala Kadumbul and Wai Jelu. Tanjong Tuak can be recognised by some high cocoanut trees.

Plan of Melolo road on 2468.

Melolo (Lat. 9° 53' S., Long. 120° 40' E.), situated by the mouth of a small stream, is the station of a posthouder, and conducts a brisk trade with Mima, on the south-east coast, Ende, and Buton.

Supplies.—Provisions in small quantities, and good water from wells, can be obtained.

Anchorage.—Two pyramids in line on the bearing 220° true lead to the road; the best anchorage is on this line or about half a cable to the south-eastward of it, in 18 fathoms, mud and sand, with the wooded point Rendi bearing 137° true.

Chart 941b, Eastern archipelago, western portion.

Coast.—South-eastward of Tanjong Wara Janga the coast is low, sandy, with a scanty undergrowth, and a broad drying coast reef extending from it. Between the small rivers Wai Bakal and Menanga Mata is the village Kalibura. On the coast reef here is Nusa Manuk, a small islet with a few trees on it; on the edge of the reef are two wrecks.

Tanjong Undu is low and sandy, close northward is the mouth of the Menanga Bodi.

Reefs.—Anchorage.—About 2½ miles eastward of Tanjong Undu, and outside the 10-fathoms line, is a ridge 5½ miles long parallel to the coast. With the exception of a small patch of 3¾ fathoms lying

General charts 941b, 942a, 2759a.

Chart 941b, Eastern archipelago, western portion. Var. $2^{\circ} 20' E$.

$3\frac{1}{2}$ miles, 64° true, from Tanjong Undu, there are depths of 6 to 7 fathoms on this ridge.

About $1\frac{2}{10}$ miles eastward is a second ridge, $2\frac{3}{4}$ miles long and a least depth of 10 fathoms over it.

There is good anchorage in 14 to 16 fathoms midway between the inner ridge and the coast reef.

SOUTH-EAST COAST OF SUMBA.—Except in the neighbourhood of Tanjong Ngunju, the south extreme of the island, this coast has no distinctive features, and rises gradually in a flat and low tableland. According to the natives, the south-easterly wind blows with great force in May and June.

Coast.—From Tanjong Undu the coast trends in a south-westerly direction for $8\frac{1}{2}$ miles, to Tanjong Batu Laga (*Lat. $10^{\circ} 10' S$, Long. $120^{\circ} 45' E$*), with a small bight in between which affords sheltered anchorage in the west monsoon. The small fishing villages Maukewau and Waibui, with the Menanga Menjeli flowing between, lie on this part of the coast.

Southward of Tanjong Batu Laga is the village Benda, and through an opening in the coast reef the shore can be approached; eastward of the village the Menanga Uda flows out forming a broad lagoon close behind the beach.

Tanjong Nangu Wara is low and flat.

Reef.—To the south-eastward of Tanjong Nangu Wara, at a distance of one to $1\frac{3}{10}$ miles from the coast, and parallel to it, is a ridge with an average depth of 4 fathoms over it, but with a small patch of $1\frac{1}{2}$ fathoms water in the middle. On the outer side this danger is steep-to; to the westward is another ridge, with $4\frac{1}{2}$ fathoms water.

Tanjong Ngaru Mangeh is low, and covered with palms; the coast reef extends here for over half a mile. A little to the westward of the point is the village Mima. To the eastward is a small bay with a sandy beach at the back, where fairly good anchorage may be obtained; the two streams Boro and Tundu Wai flow into the bay. At the entrance is a reef with 6 fathoms water over it.

Landing place.—Nearly 2 miles westward of the village Mima is a peculiar break in the coast reef, with regular depths in it, named Watu Libu, where landing can nearly always be effected without danger. The place is not easily recognised from seaward, but the opening in the reef will be seen when the steep slopes of the plateau behind Tanjong Ngaru Mangeh bear 59° true.

Tanjong Watu Perono, in the middle of the bight between Ngaru Mangeh and Tanjong Ngunju, may be easily recognised by the white cliffs of limestone formation at its extremity.

General charts 942a, 2759a.

Chart 941b, Eastern archipelago, western portion. Var. 2° 20' E.

Anchorage.—In the bay eastward of Tanjong Watu Perono the depths are very regular, and although somewhat open good anchorage can generally be obtained either on the east or west sides, according to the prevailing wind. The Menanga Waijelu flows into the bay, and 2 miles inland is the village Bai, a settlement of the Rajah of Waijelu.

Reefs.—About 2 miles to the southward of Tanjong Watu Perono, just within the 20-fathoms line, are two reefs with depths of 2 and 3 fathoms water over them, and steep-to on the outer sides; at low water the sea always breaks on them.

Tanjong Ngunju (Blackwood point) (*Lat. 10° 19' S., Long. 120° 28' E.*), the southern point of Sumba, is very remarkable; it terminates in a steep peninsula, 150 feet high, only connected with the main island by a low neck of land on the eastern side of which is a high white rock. The cape is formed by a steep mountain range, the Pengadu Sasa, which rises almost immediately from the sea to a height of about 1,500 feet. The coastline shows abundant evidence of the working of the sea, and is furrowed by gullies and ravines. Tanjong Ngunju provides, especially in the west monsoon, considerable protection against wind and sea. View at page 276.

SOUTH-WEST COAST OF SUMBA.—This coast generally rises steeply from the sea, with here and there perpendicular rocky cliffs, and west of Tanjong Melangu almost immediately attains a height of from 700 to 1,000 feet, with a few higher summits. There are few distinctive summits from seaward, so that making the land is inclined to be difficult. Nearly the whole of this part of the coast is rendered almost inaccessible by the continual surf caused by the heavy swell. Although the depths admit of vessels anchoring almost anywhere under the coast, there is, with the exception of Lamombang and Malékaba bays, practically no shelter.

Lahalura, Kotak, and Mangudu islands lie from 14 to 20 miles westward of Tanjong Ngunju and to the south-westward of Tanjong Kahanga Eia, with a channel of 30 to 60 fathoms between. Mangudu is separated from the other two by a passage of 24 fathoms depth. The south and west sides of the islands are bordered by a coast reef, on which, especially that of Mangudu, the sea breaks heavily. There are no dangers outside the 3-fathoms line.

Lahalura, the eastern and largest, is 1,043 feet high, on the northern side, and rugged. In the middle of the island is a sharp, regular, conical summit, 980 feet high; the western part is low, sandy, and covered with bushes.

Kotak is a small rocky island, 217 feet high, and lies on the edge of the drying reef west of Lahalura.

General charts 942a, 2759a.

Chart 941b, Eastern archipelago, western portion. Var. 2° 20' E.

Mangudu is low and wooded.

Coast.—From Tanjong Ngunju the coast trends in a general west-north-westerly direction for 29 miles, to Tanjong Melangu, with a few outstanding points and bights between. The depths increase regularly from the shore, and there are no dangers except close under the coast.

Tanjong Karara can be distinguished by two high rocks close against the coast, and is a steep rocky point; Tanjong Wunu lies immediately westward. To the north-eastward of these points are two summits close together, 1,240 and 1,300 feet high, with the village Parai Hai on the eastern slopes. A rock with one foot water over it lies $1\frac{1}{2}$ miles westward of Tanjong Wunu.

Taraba bay lies between Tanjong Kahanga Eia and Tanjong Hauli, and, owing to the islands lying before it, somewhat sheltered anchorage may be obtained. At the back of the bay a large plain extends to the foot of the Massu mountains, through which flows the Menanga Taraba. Off Tanjong Kahanga Eia are two high rocks, the eastern and largest, named Watu Peranja. Tanjong Hauli is 230 feet high, stands well out to sea, and is conspicuous by its white limestone formation.

Tanjong Lewitu rises perpendicularly from the sea, 6 miles north-westward of Tanjong Hauli, and is formed of very weather-beaten, bare, red rock. Several rocks lie near the coast here, and 3 cables westward of the point is a rock which dries at low water. On the northern side of the point is a small sandy beach in a crevice in the rocky coast, where landing can generally be effected.

Massu mountains.—These mountains, the highest in Sumba, rise at the back of the plain behind Taraba bay, and attain a height of 4,019 feet.

Tanjong Melangu (*Lat 10° 7' S., Long. 120° 1' E.*).—This outstanding promontory is one of the most conspicuous points of Sumba, and can be readily distinguished by the two sharp summits Hawela and Hambai in its vicinity. The point itself consists of a mass of rock of a black colour, with many cracks and crevices, and rises very regularly to the summit of the promontory, 1,600 feet high, which is connected to Hawela by a low saddle. Close under the point are two large rocks.

Malékaba and Lamombang bays afford the best anchorages on the south-west coast of Sumba, as they are in some measure protected by the broad coast reef extending from their entrance points; vessels lying here can generally keep up constant communication with the shore. At the head of both bays is a sandy beach, with low swampy ground behind. Watu Bakul, a rock 88 feet high, lies on the coast reef between the two bays.

General charts 942a, 2759a.

Chart 941b, Eastern archipelago, western portion. Var. 2° 10' E.

Malékaba bay can be entered by steering for the 1,665-foot high hill behind the bay, on a course 38° true. Entering Lamombang bay vessels must keep nearer the western entrance point to avoid the reefs extending 6 cables from the opposite side.

Kakadu bay affords little shelter for anchoring, but there is a good landing place on the eastern side of the bay which, at low water, is considerably protected by the coast reef.

Coast.—Tanjong Ngungu Wawi, 3½ miles westward of Kakadu bay, is a high point with perpendicular cliffs; at the extremity is a rocky peninsula joined to the point by a narrow ridge. About 1½ miles to the north-westward a number of islets and rocks extend out from the coast; in favourable weather anchorage may be had under the lee of the largest, named Bola Komba.

Watu Sipu, a wooded islet 295 feet high, is joined to the main island by a drying bank, and forms a good mark when navigating close under the coast.

Sipu bay, 2½ miles north-westward of Watu Sipu, lies between Tanjong Marongi (*Lat. 9° 50' S., Long. 119° 41' E.*) and Tanjong Lahikéméme, affords a little shelter on either side of the bay, according to the monsoon, and is free from danger except close under the coast.

Sendikeri bay.—In this bay, lying north-westward of Tanjong Lahikéméme, the depths are regular, and there is good anchorage, though exposed to the south-westerly swell; on both sides are a number of rocks above water, and the coast reef makes landing difficult. At a distance of 6 cables, 128° true, from Tanjong Ta Atu, the eastern entrance point of the bay, is a patch of 4 fathoms, and 5 cables, 258° true, from the same point is a rock which dries at low water, with two similar rocks three-quarters of a mile to the north-eastward.

Tides.—In Sendikeri bay the tide is mixed with a preponderating double-daily character.

The double-daily tide gives springs about 2½ days after full and change, with high water at about XIh., and an average rise of 10 to 11 feet; neaps the same interval after the quarters, with high water at Vh., and a rise of about 2 feet.

The single-daily tide has high water 1st January, about VIIh. p.m.; 1st April, Ih. p.m.; 1st July, VIIh. a.m.; and 1st October, Ih. a.m. Springs occur half a day after the moon's greatest declination, with a rise of nearly 3 feet; neaps the same interval after 0° moon's declination, with a very small rise.

The high or low waters of both spring tides cannot fall together. The highest level of the water occurs in the first half of April and

General chart 2759a.

Chart 941b, Eastern archipelago, western portion. Var. 2° 10' E.

October, when the moon's greatest declination falls 2 days after full and change.

Coast.—From Sendikeri bay the coast trends in a general westerly direction for 12 miles to Tanjong Rua, forming several small bays and bights. Good anchorage for this part of the coast may be had in the bight between Tanjong Nguju and Tanjong Rua, in 10 fathoms water, off the mouth of the Rua river. Several villages lie on the hilltops by Tanjong Rua, whose sharp pointed roofs can be seen above the trees.

Tanjong Mamba (*Lat. 9° 45' S., Long. 119° 12' E.*) projects a considerable distance seawards, and rises gradually to the hilly land behind; in the small bight to the westward landing can sometimes be effected in a gully in the coast reef at the mouth of a stream.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 30' E.

SAVU (Rai Hawu) forms, with the islands Rai Jua and Dana, the group of Savu islands. These islands are comparatively low, the highest part of Savu, Rai Piga, being 1,122 feet; of Rai Jua, 558 feet; and of Dana, 118 feet. The higher parts are mostly bare, the lower are wooded, cultivated, and intersected by many roads and footpaths; palm trees grow in large numbers on the two larger islands.

Off the north-eastern point of Savu the coast reef extends for about 7 cables.

Population.—In 1910 the population of Savu was about 21,000.

Plan of Seba road on 2468.

Seba road provides good anchorage in the east monsoon, about 2½ cables from the edge of the reef, with the lighthouse bearing 125° true, and the middle of the steep, rocky part of the coast by Kota Boddo, 185° true, in 7 fathoms, over mud and sand. In the west monsoon vessels anchor further from the shore near the 20-fathoms line. The opening in the coast reef, near the lighthouse, affords the best landing place for boats.

LIGHT.—A *white group occulting* light, showing groups of three eclipses *every thirty seconds*, thus:—light, *fifteen seconds*; eclipse, *three seconds*; light, *three seconds*; eclipse, *three seconds*; light, *three seconds*; eclipse, *three seconds*, is exhibited, at an elevation of 52 feet above high water, from a white iron framework, 46 feet high, situated close northward of the white pyramid at Seba. It is visible from a distance of 12 miles.

Supplies.—Cattle, sheep, pigs, poultry, and fruit are obtainable. Drinking water can only be obtained in cases of necessity through the Dutch posthouder.

General charts 941b, 942a, 2759a.

Plan of Seba road on 2468. Var. 2° 30' E.

Communication.—About every four weeks the mail steamer calls from Surabaya.

Tides.—The tide is generally of a double-daily character, having springs about 2 days after full and change, with a rise of 12 feet, and neaps about 2 days after the quarters, with a rise of $3\frac{1}{2}$ feet.

Chart 942a, Eastern archipelago, eastern portion.

Rai Jua is about 8 miles in length in an east and west direction, and has a population of about 1,100. The Rajah of the island lives in a village on the north coast.

The channel between Rai Jua and Savu is $2\frac{1}{2}$ miles broad, clear, and deep, but a strong current runs.

Dana island, 18 miles to the south-westward of Rai Jua, is uninhabited, low, and covered with scrub, with a ridge along its north-eastern side of 118 feet elevation, the western part of which is a detached knoll like a short horn. On the north coast lies a conspicuous bare rock, 112 feet high. Wild goats abound on the island, but there is no fresh water.

Anchorage may be had in 16 fathoms northward of the above-mentioned rock, with the extremes of the island bearing 144° true and 206° true. Wind and weather permitting, the best landing place is on the north-east coast, where there is a sandy beach.

ISLANDS EAST OF FLORES.—**Moriya or Alu strait**, between Lomblem and Pantar islands, appears to be safe, and has been frequented by junks and vessels from Macao and Makassar to Timor, but the tidal streams in it are violent and render a ship ungovernable at times, and in case of calms, which are frequent, there is no known anchorage.

Lapang (Flat) and Batang (Green) islands, in the northern entrance of the strait, are two low islands on a large reef which extends 3 or 4 miles northward of Lapang, leaving only a channel of 2 miles width between Batang and Pantar islands. Lapang island is very low (about 50 feet high), and covered with brushwood on the north side; the south side is bare. Batang island is small, but fairly high, and is formed of reddish rock.

Moriya or Kelang island, low and flat, is separated from Pantar island by a passage fit for praus. The west point of Moriya is very conspicuous by a beach of white sand and five isolated trees.

Rusa or Middle island (*Lat. $8^\circ 26'$ S., Long. $123^\circ 51'$ E.*), in the middle of the strait, has a reddish rocky and barren appearance; a reef extends 3 miles from its western side, and has a high rock on its extremity.

General charts 942a, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

Babi or Little island appears low and flat in comparison with the neighbouring high promontory forming the south-west point of Pantar, from which it is separated by a channel which appears dangerous, but has not been examined. The island is surrounded by rocks.

Pantar island is about 28 miles in length north-east, and is but little known. The northern point is bordered by a reef extending 2 miles off, with many dry rocks on it. From this point the western coast trends south-west, forming several bays.

Bernusi bay, on the north-west coast of Pantar, is about 5 miles deep, but the entrance is only one cable wide between the reefs on either side; in the bay lies the village Blang Meran, and there is anchorage in 21 fathoms.

The south-west point of Pantar is high, and bordered by a reef which extends one mile to the south; on its outer edge there is a large rock on which the sea breaks heavily. On the south point there is a peak 3,202 feet high.

Tides.—It was observed to be high water in Morija strait two days before full moon between IXh. and Xh. a.m. The flood stream sets north and the ebb south.

Directions.—Morija strait is little frequented, as calms and the violence of the tidal streams encountered in it, render it dangerous. It appears, however, preferable to Pantar strait. It is not advisable to attempt this passage when bound to the southward in the south-east monsoon, as it would be difficult to get through in one tide, the winds then blowing strong from south to south-south-west.

Morija strait may easily be known, as well from the north as from the south, by the high mountains on the north-east point of Lomblem. Batang island is also a good guide in coming from the northward; and Lomblem and Pantar are both high land.

Great care is requisite in passing before the entrance of the strait, not to approach Lomblem within a distance of 12 miles, as ships are liable to be drawn into the strait. This caution applies to all the straits east of Java.

Pantar or Twerin strait, between Pantar and Ombai, is about 25 miles long, and about 5 miles wide at either end, with Pura Besar lying full in the middle within. Panjang island (*Lat. 8° 11' S., Long. 124° 22' E.*), in the northern part of the strait, is small and low, with a small hummock near the centre. Reta island, 2 miles south of Panjang, to which it is connected by a reef, rises in a cone 1,800 feet high. Pura Besar, 3 miles further south, is about 4 miles in length, and rises to a double peak 3,620 feet high. Twerin island, in the south part of the strait, is high, and about one mile in diameter. View at page 284.

General chart 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 50' E.

Directions for Pantar strait.—Pantar strait is very little used, being narrower than Morija strait, situated between higher land, and consequently more subject to sudden squalls. The best channel appears to be between the islands in the north part of the strait, and the coast of Ombai, and on either side of Twerin island, but to the westward is preferable. The narrowest part of the channel, between Pura Besar island and the reef off the north point of Kebola bay, is one mile wide, and here the streams attain a rate of 7 knots two days after new moon. Navigation in the strait is rendered difficult by whirling eddies, which should be avoided. There appears to be no anchorage in the strait except in Kebola bay.

OMBAI or ALOR ISLAND is about 48 miles in length, east and west, and 15 miles wide. It is high throughout, especially at the east part, and is covered with high trees to the summits of the mountains. It is of volcanic formation, but is not known to contain any active volcanoes. The inhabitants are a race of the same character as those of Flores.

The island appears to be everywhere steep and safe to approach; the eastern coast was examined in 1885, and is mountainous and rugged, but well wooded, it rises in a fine peak to a height of 6,066 feet, which is apparently the highest point of the island. Villages do not appear to be numerous, and but little cultivation was observed. The coastline is bold, and in many places cliffy. It is apparently free from dangers or from fringing reefs except the reef surrounding Soangi and at the north-east point, where a reef extends to a distance of half a mile from the shore; this point is marked by a conspicuous patch of white sand.

Kebola bay is an inlet on the west coast, about 8 miles in length and one mile wide. A reef with an islet on it, extends more than $1\frac{1}{2}$ miles from the north point of entrance. On the north side of the bay are the villages Alor and Dalolo; there is anchorage off the former in 30 fathoms.

Plan of Dalolo anchorage on 2468.

There is anchorage (*Lat. 8° 12' S., Long. 124° 21' E.*) off the village of Dalolo, in 18 fathoms, $1\frac{1}{2}$ cables 172° true from the flagstaff. There is also anchorage off the village of Alor, westward of Dalolo.

Chart 942a, Eastern archipelago, eastern portion.

Anchorage was found about 4 miles westward of the south-east point of the island in a fairly sheltered position out of the strength of the stream although at a short distance from the coast it was running with considerable velocity to the west-south-westward.

About 10 miles westward of the south-east point a reef is believed to extend one mile from the shore; in other parts the coast may generally be approached to 2 cables.

General charts 942a, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. $2^{\circ} 40'$ E.

The north-west point is high and bold, but a reef is charted about a mile off it; the islet of Soangi, about 9 miles eastward of the point, is connected with Ombai by a reef which partly dries. Discoloured water and breakers extend eastward 4 miles from the islet.

OMBAI PASSAGE (Malua strait), between Ombai and the north-west coast of Timor, is 16 miles wide in the narrowest part, and is apparently free of dangers. It is generally used by sailing ships bound to China late in the season and reaching the eastern passages towards the end of the year.

Winds and weather.—In the partially enclosed region northward of Savu and Timor, known as the Timor sea, especially in the eastern portion, the percentage of bright sky is greater than in any other part of the archipelago, and the haziness is equally great whenever easterly winds blow; the rainfall is exceptionally small, and is most in January and February, but showers may fall with all westerly winds.

The south-east monsoon blows steadily between April and September, from east-south-east to south-east, the land breezes from Timor increasing at night, and the sea breezes diminishing by day the force of the wind; similarly in the other season the wind will be most steady by day and unreliable at night.

In October and November the winds are from south-south-east to south-south-west, and in December from the south-west quarter, accompanied by thunderstorms, but the westerly monsoon does not reach its full development, from west to west-north-west, until January, and begins to abate in February. Circulating and variable winds will then blow until April.

Currents and tidal streams.—In both seasons the general set of the current is south-westward, in the eastern monsoon the average rate is about 18 miles in 24 hours, and in the western 10 miles; the highest recorded are 38 and 25 miles, respectively.

In the narrower part of Ombai passage, during the westerly monsoon, the set will often be to the north-east, with strong ripplings; probably the wind drift is more apparent here, and the flood stream, owing to the contraction of the passage, would be more pronounced. Near the land tidal streams are stronger, but under the islands on the north side currents are said to be exceptionally weak, and vessels with contrary winds are recommended to work along these shores.

Directions for Ombai passage.—Vessels proceeding north-eastward through Ombai passage should make the east point of Sumba (*Lat. $10^{\circ} 8'$ S., Long. $120^{\circ} 51'$ E.*), and pass between it and Savu, or between Savu and Rotti if they fall to leeward with north-westerly wind. Under the exceptional conditions of a strong north-west wind and lee current, it may be desirable to pass westward of Sumba and south of Flores island.

General chart 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

TIMOR, the largest of the Lesser Sunda islands, and the easternmost of those known by that name, is 255 miles in length, in a north-east direction, and 40 to 55 miles in breadth, tapering gradually to the east end. It lies in an oblique direction to the chain of volcanoes from Java to Banda, and its geological formation is very different, consisting mainly of slates, schists, and sandstones, with limestone rocks of carboniferous age at the western extremity, as well as much raised coral rock. Notwithstanding the absence of volcanic formation, the island is subject to frequent earthquakes, one of which, in 1794, did much damage to Koepang.

Timor is mountainous throughout, but the ranges seldom rise higher than 6,000 or 7,000 feet, though Mount Ramelau (*Lat. 8° 55' S., Long. 125° 30' E.*) attains a height of 9,678 feet, and is seen 80 miles to seaward. The hills are generally bare or thinly wooded, and often exceedingly sterile. The interior seems to be an extensive tableland, cut up into numerous parallel ridges, with intervening valleys. These high lands produce excellent wheat and potatoes, while sheep and ponies appear to thrive. The rivers are numerous, but are not navigable, and from the excessive drought of the dry season and the porous nature of the soil, many of them do not reach the sea at that time of the year. The only metals known to exist are iron, and small quantities of copper and gold. Sandalwood of the best quality abounds, and forms one of the chief exports of the island.

The inhabitants of Timor appear to be wholly of Papuan race, but of a type distinct from the natives of New Guinea; their hair is less frizzled, their colour somewhat lighter, and their features not so prominent. They are divided into many small tribes, speaking a variety of languages, are warlike, and for the most part have preserved their independence.

The western part of the island is under the nominal rule of the Dutch, whose chief settlement is at Koepang, with a mixed population of Malays, Chinese, Dutch, and natives. The Dutch Resident supervises the government of the eleven native states into which this part of the island is divided, as well as of the islands of Semaó and Rotti to the south-west, the latter forming the southernmost land of the Malay archipelago, and inhabited by a people of Malay rather than Papuan type.

The Portuguese possessions are the eastern portion of the island; within the Dutch limits, however, the Portuguese have control over the native state of Sutrana, on the north-west coast. The chief Portuguese settlement is at Dilhi, on the north coast.

The climate of Timor resembles that of North Australia. The north-west monsoon brings with it heavy rains and overcast weather, which

General chart 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 30' E.

is very detrimental to European constitutions; while, during the south-east monsoon, the climate is dry and pleasant, with light airs and fresh temperature.

Rotti (Roti) and Landu, about 6 miles south-west from the south-west point of Timor, are joined by a very narrow isthmus, under water at spring tides, forming Telok Pepela on the east and Karbaffo bay on the west. Their united length is about 45 miles, and mean breadth 12 miles.

The coasts of the islands are bold and rocky, bordered throughout by reefs, which on the east extend in some places to a distance of 3 miles, and on the west to one mile.

Rotti is of moderate height, Ailai, the highest point, being 1,461 feet high, with undulating hills; the soil is fertile, but there is a scarcity of water, with little cultivation. The only Dutch official is a civil authority at Baah, on the north-west coast.

Plan of Koe pang bay and approaches on 3296.

The northern half of Landu is an almost uninhabited wilderness, the natives living principally in the southern part and south-east coast. The small island Bibi lies on the coast reef by the north point of Landu, and the hilly island Usu near the east coast. Depths of 5 fathoms extend a mile eastward of the latter island.

Plan of Cyrus harbour on 2468.

Buka bay or Cyrus harbour, on the south side of Rotti, is formed by a deep inward curve of the coast, and a girdle of islets and reefs projecting 2 miles eastward from the south point of the bay, and $1\frac{1}{2}$ miles south from the north-east point, with the islets of Lai and Tilluk (Tilu) on the latter. The north and west sides of the bay are fringed with a bank of sand and coral, from a half to 2 miles wide, with several small islets on the edge; Batu Tua (*Lat. 10° 52' S., Long. 123° 1' E.*) is the eastern and largest, a white stone beacon, conspicuous from seaward, stands on it.

In the middle of the bay are two large reefs, dry at low water, the eastern named Karang Makemu and the western Karang Naru; northward of these reefs is an extensive basin, with anchorage in 5 to 12 fathoms, mud, and good holding ground.

The entrance to the harbour is 3 cables wide, between the north side of Karang Makemu and the edge of the shore bank on the north side, which dries at low water; in the centre of this passage the depth is 15 fathoms.

In fine weather there is good anchorage half a mile from the islets on the north side of the harbour; but with a strong easterly monsoon some

General charts 942a, 2759a.

Plan of Cyrus harbour on 2468. Var. 2° 30' E.

swell and sea are felt here, and a better position, with greater convenience in landing, will then be found south-westward of Karang Naru. The island Manuk, on the west side of the bay, is inhabited.

Passing half a mile southward of the reef around the small islet of Tilluk, on the north-east side of the harbour, a course 306° true for the right side of a fairly conspicuous flat-topped hill will lead in between the entrance points. Steering for the stone pyramid on Batu Tua, 300° true, will also lead into the harbour, but passes somewhat closer to Karang Makemu.

Supplies.—Buffaloes, goats, poultry, and fresh water can be obtained.

Tides.—It is high water, full and change, at 0h. 0m.; springs rise 6 feet.

Chart 942a, Eastern archipelago, eastern portion.

The coast of Rotti eastward of Lai islet, for 9 miles to Tanjong Puleh (Bokaai) curves inward, with a remarkable bare cliff, 650 feet high, midway between.

Plan of Koepang bay and approaches on 3296.

Tanjong Ringau (Manuai) (Piakokoli) (*Lat. 10° 39' S., Long. 123° 26' E.*), the north-east point of Rotti, is 14 miles from Tanjong Puleh, the coast between also forming an inward curve, with three separate hills, of about 800 feet, close to the shore. Tanjong Ringau is low, with a flat hill near the extremity, and composed of sandy beaches with rocky portions between; a broad reef, which dries at low water, extends some distance off, dipping gradually seaward, and depths of 52 and 37 fathoms were obtained a mile from the point.

From Tanjong Ringau the north coast turns sharply westward, with broad fringing reefs blocking the approach to Telok Pepela (between Rotti and Usu), to which there is only a very narrow ship channel.

In the west monsoon there is good temporary anchorage, in 12 fathoms, coral bottom, with Tanjong Ringau bearing 158° true, and Batu Luwak in line with a small conical hill 276° true. A little southward of this position there is a break in the reef, about 700 yards in width, with 12 fathoms, sand, where landing is practicable at any time of tide. One mile inland is the village of Opauw.

Plan of Karbaffo bay on 2468.

Karbaffo (Korobafo) bay, on the western side of the low isthmus between Rotti and Landu, is entered through a narrow clear channel, barely a cable wide at its narrowest part, and with depths of from 6 to 12 fathoms. The bay itself is obstructed by reefs, which mostly dry at low water, and is only navigable for small vessels. Coral

General charts 942a, 2759a.

Plan of Karbaffo bay on 2468. Var. $2^{\circ} 30'$ E.

reefs extend for a mile off-shore from both the outer entrance points. The village Landu lies on the northern side of the bay, about 2 miles inland.

The Netherlands Government ship *Flamingo* anchored in Karbaffo bay in 16 fathoms, with the road to Karbaffo bearing 207° true, and the road to Landu 66° true.

Plan of Baah road on 2468.

Baah (Baä) road, on the north-west coast of Rotti, affords anchorage in 13 fathoms, about 2 cables from the shore reef, with the lighthouse bearing 152° true, distant $4\frac{1}{2}$ cables, and a clump of trees near the shore 102° true. Some detached rocks lie close to the point, about a mile westward of the lighthouse, on one of which a white stone pyramid is erected.

LIGHT (Lat. $10^{\circ} 43'$ S., Long. $123^{\circ} 3'$ E.).—From a white iron frame lighthouse, 46 feet high, near the flagstaff at Baah, is exhibited, at an elevation of 48 feet above high water, a *white group flashing* light showing three flashes *every thirty seconds*, thus:—flash, *three seconds*; eclipse, *three seconds*; flash, *three seconds*; eclipse, *three seconds*; flash, *three seconds*; eclipse, *fifteen seconds*. It is visible from a distance of 12 miles. For the arc of visibility, see Light list.

Communication.—A mail steamer calls every four weeks on the Surabaya, Makassar, Sunda islands, Timor route.

Chart 942a, Eastern archipelago, eastern portion.

Dana island, the southernmost island off Rotti, is low. A coral bank, on which the least water obtained was 11 fathoms, lies 6 miles, 280° true, from Dana.

Haliana, north of Dana, is a rocky islet with steep cliffs, 347 feet high. It is conspicuous at a distance of 20 miles, when all the neighbouring land except the hills of Rotti has dipped.

Dau (Dao) island is 7 miles west of Rotti. Between Dau and Du (Doö) islet, about 2 miles eastward, there is a channel with 8 fathoms.

Nusa island is off the west point of Rotti; a reef juts out from the point more than half-way to the island, but a passage with 7 or 8 fathoms water will be found by borrowing on the island side.

All the above islands are surrounded by reefs to the distance of a half to three-quarters of a mile.

Plan of Koepang bay and approaches on 3296.

Beatrice rock is a circular coral reef about half a mile in diameter, with a knoll of 3 fathoms water on it, over which the sea

General charts 942a, 2759a.

Plan of Koepang bay and approaches on 3296. Var. 2° 30' E.

frequently breaks; on the remainder of the shoal there are 4 to 6 fathoms, deepening to 8 and 10 fathoms at either end, where there is tolerable anchorage. The centre of the rock is situated $9\frac{1}{2}$ miles eastward of the east point of Usu. At $2\frac{1}{2}$ miles further westward is a patch of 4 fathoms, with deep water between.

Rotti strait, between Landu and Timor, is about 6 miles wide, with soundings of 76 to 136 fathoms in the middle. A shoal of 9 fathoms least water lies $5\frac{1}{2}$ miles northward of Usu.

- In December a current has been observed running to the westward at the rate of nearly 3 knots.

Semao island, off the south-west end of Timor, is about 15 miles long north-north-east, and 5 miles wide. The island rises in a chain of rather flat hills, covered with trees, through which bare limestone cliffs show, giving a somewhat barren appearance. The eastern coast consists of steep coral cliffs rising vertically from the sea, the harbour of Pelican bay, about midway, penetrating half-way through the island. The shore is generally safe to approach, except on the west side, where a reef projects, at 5 miles northward of Tebui island.

Pelican bay.—The entrance to this bay, southward of Kambing island, is about 2 cables broad, with depths of 9 to 14 fathoms. Westward of Kambing (Kambang) is a reef with two rocks above water, named Batu Oho, and to the northward of this a small reef of $1\frac{1}{2}$ fathoms. In the narrow channel to the southward of Batu Oho is 8 to 9 fathoms water, and the anchorage is westward of this reef in 10 fathoms.

Plan of Hansisi anchorage on 3296.

Hansisi.—Coaling station.—Close westward of Tanjong Hansisi (*Lat. 10° 11' S., Long. 123° 30' E.*), the eastern point of Semao, is the small village Hansisi, where the Netherlands India Government coal sheds are situated. A coral reef extends from the coast, but outside this the depths increase rapidly, and 30 fathoms will be found half a mile from the shore. Vessels lie very sheltered in the west monsoon; in the east monsoon coaling is sometimes rather difficult.

From 3,000 to 4,000 tons of coal are imported annually, and from 500 to 1,000 tons are generally in stock. It is brought off in baskets by lighters, each carrying 20 tons; about 200 tons can be loaded a day.

Anchorage.—Great care is necessary in taking up anchorage from the steep and sudden shelving of the bottom. The shore is fringed by a rough jagged reef of coral, at the edge of which the water deepens quickly to 10 fathoms, and at a distance of half a mile

General charts 942a, 2759a.

Plan of Hansisi anchorage on 3296. Var. 2° 30' E.

from the shore, to 30 fathoms, the bottom being mainly coral with patches of sand between. A large ship should not anchor nearer than in a depth of 20 fathoms, to avoid swinging dangerously close to the reef. Smaller vessels may anchor a little closer to the island in 16 fathoms, with a white painted tree between the two coaling sheds, about 337° true, and Tikus island (Koepang bay) just behind the nearest point of Semaó island; or in 18 fathoms, with Tanjong Hansisi bearing about 39° true.

Plan of Koepang bay and approaches on 3296.

Semaó strait, separating Semaó from Timor, is about 10 miles in length, 2 miles in width at the southern entrance, and about 1½ miles at the northern end. The depth of water in it varies from 24 to 50 fathoms in mid-channel. Tanjong Usina (Oisina) (*Lat. 10° 21' S., Long. 123° 28' E.*), the south-west point of Timor, is a long low point, from which a reef projects, with 12 to 18 fathoms water near its edge; a ridge with a least depth of 7 fathoms over it lies 1½ miles, 255° true, from the point. Off Batu Bau the reefs extend a mile, also spits from the outer points, and from Hansisi, the east point of Semaó; they are, however, easily seen when the sun is in a favourable position.

Tidal streams.—The flood stream sets to the northward, and the ebb to the southward, with a velocity of 3 knots.

Plan of Batu Bau road on 2468.

Batu Bau road, on the east side of Semaó strait, is but 3 cables wide, between the coast bank and a detached reef westwards. The anchorage, in 13 fathoms, is with the village of Batu Bau bearing 75° true, distant 8 cables; and Toblolong village 187° true. There is a depth of 4 fathoms in the approach, southward of the protecting reef, and 7 cables from the anchorage. A rock, which dries, was reported in 1911 about 1½ cables westward of the southern part of the detached reef.

Plan of Koepang bay on 3296.

KOEPAK BAY is 8 miles wide at the entrance between Tanjong Pakula (Pakulak) and Batu Nutun (Tanjong Fanot), and within this line it extends about 12 miles to the eastward. The depth in the middle of the entrance is over 30 fathoms, shoaling gradually to the eastward, but continuing deep towards Koepang to within half a mile of the shore reef; the head of the bay is shallow, the 3-fathoms line reaching about 5 miles from the land.

Tanjong Pakula is low; Mount Fatu Sono, 1,716 feet high, 6 miles north-east from Tanjong Pakula, has a remarkably rugged appearance, and may be seen from westward long before Semaó and Rotti are recognised. Reefs extend round Tanjong Pakula, and reach eastward as far

General charts 942a, 2759a.

Plan of Koepang bay on 3296. Var. 2° 30' E.

as Tikus islet, a small round wooded islet, 92 feet high, steep-to on the south-east side; hence the reef turns north-eastward towards Burung island, 3 miles distant, which is also enclosed by it. The reefs are partly dry at low water, and the depth diminishes rapidly from 10 fathoms to $1\frac{1}{2}$ at their edge. Vessels should not pass within the line joining Tikus and Burung islands.

Kera island, in the middle of the entrance to Koepang bay, is a low sandy island covered with brushwood, 59 feet high, and surrounded by a reef partly dry at low water, reaching half a mile off the east, and a mile of the west side. There is a large tree on the north-east part of the island; and with the sun to the west a white beach is conspicuous.

Koepang, the chief town of the Dutch settlement in Timor, and seat of the Resident and Assistant Resident, is situated on the southern shore of the bay, about 3 miles eastward of Semao strait. Fort Concordia (*Lat. 10° 10' S., Long. 123° 34' E.*) stands near the edge of a cliff westward of the town, from which it is separated by a small river capable of admitting vessels of light draught at high water. The best landing place is on the sandy beach eastward of the river's mouth.

The trade is chiefly in the hands of Chinese; exports are ponies, coffee, sandalwood, and beeswax.

The climate is dry and pleasant, with light airs and cool temperature during the south-east monsoon. From December to February it is wet and rather feverish.

Supplies.—Buffaloes, small sheep, poultry, bread, and vegetables are procurable; buffalo milk is plentiful. Ship chandlers' stores are not procurable. The water supply is excellent; the best is obtained from a standpipe at the eastern extremity of the sea-wall. It is supplied free, but there are no tanks, and ships must send their own boats for it.

Communication.—Vessels of the Royal Dutch Packet Company call every four weeks at Koepang, on the Surabaya, Sunda islands, Timor route; and every month from Makassar.

Wireless telegraph.—There is a wireless telegraph station at Koepang; the call letters are P.K.D.

LIGHT.—A *flashing white light every three seconds*, showing a flash of *one second* duration, is exhibited, at an elevation of 61 feet above high water, from a white iron framework, 34 feet high on Fort Concordia. It is visible from a distance of 12 miles, but is obscured from northward by Kera island.

Beacon.—A white stone pyramid is erected at a distance of 1,050 yards, 58° true, from the light support.

Anchorage.—The anchorage is in 10 fathoms, mud, with the light support bearing 152° true, and the white stone pyramid 85° true..

General charts 942a, 2759a.

Plan of Koepang road on 3296. Var. 2° 30' E.

The flood tide, setting to the eastward along the coast, is felt strongly; the ebb is not much felt. In the north-west monsoon a heavy swell rolls in, and during the severe gales which sometimes blow at that time, vessels are compelled to quit this anchorage and find shelter under Tanjong Hansisi, where the bottom is foul and steep, with strong tidal streams; or on the north side of Koepang bay, in about 16 fathoms, a mile south-west of Burung island.

Tides.—It is high water in Koepang bay, at full and change, at XIIh.; springs rise 9 feet, neaps 6½ feet.

Chart 942a, Eastern archipelago, eastern portion.

THE WEST COAST OF TIMOR is generally steep-to, and over a considerable portion anchorages are frequently found. From Tanjong Pakula to Tanjong Baratti (Barate), 9 miles northward, a stony coast rises almost perpendicularly to a moderate height, and the water is very deep close to.

There is anchorage in a small bay southward of Tanjong Baratti; also eastward of the point, off the village of Baratti, in 6 to 9 fathoms, but a bank of less than 3 fathoms water juts out some distance from the little Sungi Mekuk, into which boats can enter at high water. Northward of Baratti is Ayer Kosambe, a reef which dries at low water, marked by a beacon with white truncated cone, and is the only danger off the coast as far north as Batu Anjo (Menango). From this reef there is anchorage along the shore to Tanjong Kurus, a high grass-covered point 7 miles to northward, with detached rocks off and deep water close to. Frequent anchorages, in 6 to 17 fathoms, will also be found between Tanjongs Kurus and Mas, 8 miles further, this part of the coast having a sandy shore.

Tanjong Mas (*Lat. 9° 38' S., Long. 123° 40' E.*) is 310 feet high, and at a distance appears as a detached hummock; between this and Tanjong Gemuk, a distance of 10 miles, depths are found of 20 to 14 fathoms, deepening again near the latter point, from which loose stones extend a cable's length; a strong current and tide-rips make it advisable to round the point at a moderate distance.

Plan of Naikliu road on 2468.

Naikliu road is an indentation of the coast, with a sandy shore, east of Tanjong Gemuk, and 40 miles from Koepang bay. The village of Naikliu is in the centre of the bight 2 miles from Tanjong Gemuk, and the shore bank is here one cable wide. The anchorage, in 11 fathoms, is 3 cables north of the village, with Tanjong Gemuk 270° true. View at page 308.

Eastward of Naikliu there is very deep water close to the coast.

General charts 942a, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

Batu Anjo (Menango), a rock which dries at low water, is scarcely half a mile from the shore, and 3 miles north-eastward of Tanjong Gemuk. One-third of a mile northward of the rock, and the same distance off-shore, anchorage was found in 14 fathoms.

Sutrana road.—There is good anchorage westward of Sungai Sutrana, in 11 to 15 fathoms, with room to swing in-shore in a sufficient depth of water.

Batik island (Gula Batu) (*Lat. 9° 15' S., Long. 123° 59' E.*), nearly 6 miles from the coast and 207 feet high, is small, with white cliffs. It is not advisable to anchor near the island.

Of many conspicuous hills upon the portion of Timor above described, Mount Timau, 5,728 feet in height, is the most remarkable, and appears saddle-shaped from north and south, but from the direction of Naikliu as a partially bare sharp peak.

Tul Ikam (Tulang Ikam) bay. — Anchorage has been obtained, in 40 fathoms, 18 miles eastward of Batik, about 2 cables' length off-shore, with the flagstaff bearing 177° true. Some refreshments were procured.

Okusi road, separated from Tul Ikam bay by a low point, affords anchorage in 22 fathoms, about 2 cables' length from the shore, with the houses bearing 178° true.

Sutrana, Tul Ikam, and Okusi are under Portuguese government.

Plan of Atapopa road on 2468.

ATAPOPA (ATAPUPU) ROAD.—Atapopa, 31 miles eastward of Okusi, is a Dutch settlement, which cannot be seen at more than 2 miles distance, as the land rises immediately behind. A reef, which nearly dries at low water, projects half a mile off-shore on each side of the entrance; the eastern reef generally breaks, but the western rarely. Between these reefs a narrow channel leads to a basin, 3 cables in greatest width, with depths of 5 to 14 fathoms. View at page 308.

Anchorage.—In the south-east monsoon vessels can anchor in the outer roads in 30 to 40 fathoms, brown sand, about half a mile north-westward of Dolilo village, with a white pyramidal tomb, half a cable south of a conspicuous tree, in line with a gap in the mountains bearing 164° true. This mark also leads through the break in the reefs to the inner anchorage, where vessels can anchor a quarter of a mile west of Dolilo village, in 6 to 8 fathoms; it is necessary to moor in the inner anchorage.

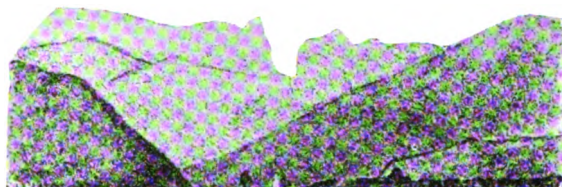
General charts 942a, 2759a.

Kapala Tanessi.



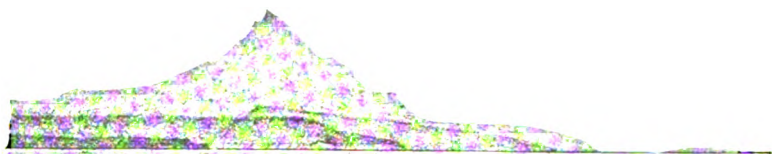
Flagstaff bearing 200° true.

Timor, north coast. Naikliu road.



Gap in mountains in line with white tomb, bearing 164° true.

Timor, north coast. Atapopa road.



Peak, 40° true.

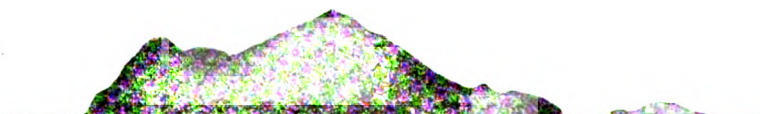
Nusa Besi.

Timor, east point.



*Batu Putih bearing
197° true.*

Timor, south coast; Batu Putih.



Summit bearing 341° true, 11 m.

Liran.

Kambing, north of Timor.

Plan of Atapopa road on 2468. Var. 2° 50' E.

Caution.—In 1910 a depth of less than 3 fathoms was reported on the leading line; it is advisable to keep the tomb in line with the eastern side of the gap.

Beacon.—A small white beacon marks a little patch of coral immediately within the entrance, and very near the alignment of the leading marks. Vessels should pass eastward of the beacon.

Atapopa village is situated at the foot of a gorge in the mountains, and is reached by a narrow channel leading southward from the basin, with depths of 5 to $3\frac{1}{2}$ fathoms. The inhabitants are almost exclusively Chinese. The Dutch *contrôleur* of Belu resides here.

Supplies.—A few buffaloes and a little fruit may be obtained. The water of the river is unwholesome below the village. The trade is mainly sandalwood.

Communication.—Vessels of the Royal Dutch Packet Company visit Atapopa on the same voyages as Koepang (page 306).

Chart 942a, Eastern archipelago, eastern part.

Batu Gadé, 7 miles north-east of Atapopa, is a Portuguese settlement, lying in a valley surrounded by picturesque mountains. Northward of the anchorage is a black rock, about 120 feet long and 30 to 40 feet high, connected to the shore by a ledge dry at low water. From seaward the rock shows as a black square against the green background. The anchorage is in 11 fathoms, sand and mud, one cable off-shore, abreast of the fort, with the flagstaff bearing 148° true, and the rock 33° true. The water deepens rapidly to seaward; the best landing is near the fort, where boats are moored.

Supplies.—A few cattle, firewood, and water, can be procured, but a heavy surf on the beach renders watering difficult.

Tidal streams in this road, and further to the westward, close in-shore, change with the tides, but are weak.

Coast.—Reefs extend from the point 8 miles north-eastward of Batu Gadé, and also from Tanjong Parimbala (*Lat. $8^{\circ} 38' S.$, Long. $125^{\circ} 9' E.$*), 13 miles further on. Tanjong Maubara is bordered by a reef to a distance of one mile. The narrowest part of the Ombai passage is abreast of Tanjong Maubara, and is 15 miles wide.

THE NORTH COAST OF TIMOR, from Tanjong Parimbala to Tanjong Fatakoma, east of Dilhi, is steep-to; some parts of it

General charts 942a, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 3° 0' E.

are covered with mangroves, and fronted by a coral reef, but in no place was this observed to extend more than a few yards from the shore. From Tanjong Fatakoma eastward to Tanjong Subang, the coastline is for the most part overgrown by mangroves, and fronted by a coral reef which varies in width from a few yards to about three-quarters of a mile. From Tanjong Subang to Tanjong Mantote the land falls almost precipitously to the sea.

Mountains.—A range of mountains, about 4,000 feet high, runs parallel to the coast and about 5 miles from it, between Tanjong Maubara and Dilhi. South of this range, Mount Ramelau, one of the most conspicuous mountains of this part of Timor, rises to a sharp cone 9,678 feet high. Another conspicuous mark is Cliff peak, 4,367 feet high, near the coast 20 miles east of Dilhi; the northern face of this hill is a precipitous cliff. It should be borne in mind that when the south-east monsoon blows fresh the high land is almost invariably wrapped in clouds, so that the tops of hills of even moderate height are rarely visible.

Plan of Dilhi harbour on 1400.

DILHI, about 26 miles eastward of Tanjong Parimbala, is the principal Portuguese establishment in Timor, and is frequented by vessels passing through Ombai passage when in want of provisions. From the low situation of the town under the high land, it is with difficulty perceived when coming from the northward; but to the eastward there is the bluff, projecting Tanjong Fatakoma, by which it may be known, and the houses as well as the flagstaff will be visible when about 4 miles distant from the Timor coast, with the peak of Kambing island bearing 7° true.

Dilhi harbour, about half a mile in extent, is formed by reefs projecting from the points of the bay and another reef between them, leaving a narrow deep passage on either side. These reefs are mostly dry at low water, and consist of sand and coral. The western entrance is one cable wide and most used, but it is difficult for a sailing vessel to run out through this channel when there is no land breeze.

LIGHT (*Lat. 8° 32' S., Long. 125° 34' E.*).—From a lighthouse on Stanley point, the west point of the harbour, is exhibited an *alternating fixed and flashing light*, showing *white fixed* with a *red flash every half-minute*. The light is 65 feet above the sea, and visible in clear weather 13 miles. The building, a truncated cone of masonry surmounted by an iron framework, is coloured blue and white in horizontal stripes.

Buoys.—The western channel is marked by a black buoy, moored in 3 fathoms on the western extremity of the detached reef; and a

General charts 942a, 2759a.

Plan of Dilhi harbour on 1460. Var. 3° 0' E.

white buoy on the edge of the shore reef, northward of the lighthouse. A red and white chequered buoy marks the north edge of the rock awash, $3\frac{1}{2}$ cables, 312° true, from the Custom-house pier.

The eastern channel is marked by two white buoys, placed respectively at the north-east and south-east edge of the detached coral reef; and by a black buoy on the south-west point of the reef projecting from the east side of the bay. A red and white chequered buoy is moored on the north side of a coral reef which dries, lying in the fairway less than a cable within the eastern passage.

A red and white chequered buoy is on the north-west side of a pinnacle of coral, with 3 feet over, north-west of the Custom house. There is a deep channel, 50 yards wide, between this and the land.

All the buoys, except the last mentioned, are surmounted by a staff and ball, painted the same colour or colours as the buoys they surmount.

Outer anchorage.—Large vessels which only stop for refreshments should anchor outside the harbour, on Brilliant bank, with the lighthouse bearing 162° true, distant $1\frac{1}{2}$ miles, and Tanjong Fatakoma 76° true. The bank extends about three-quarters of a mile east and west, and has a least depth of 13 fathoms.

Inner anchorage is in 13 to 10 fathoms, mud, with the barracks flagstaff bearing 134° true, and the Governor's palace, 227° true; for loading and unloading it is more convenient to anchor close under the shore to the westward of the 3-foot coral reef, in 12 fathoms, and with the ship's stern made fast to one of the large trees.

Tides.—It is high water, at full and change, at 1h.; springs rise 6 feet. The tidal streams are very weak.

Winds.—As sea breezes blow regularly during the day, entering the harbour is easy during the south-east monsoon, and the land breeze permits vessels to sail out early in the morning.

Directions.—Western channel.—To enter Dilhi harbour by this channel a vessel should pass between the black and white buoys, in depths of 9 to 12 fathoms, then bring the barracks flagstaff to bear 132° true, and steer for it on that bearing, in depths of 13 to 14 fathoms. This course leads eastward of the rock awash marked by a red and white chequered buoy; when this is passed steer towards the Custom house (*Lat. $8^\circ 32'$ S., Long. $125^\circ 35'$ E.*), a large building near the beach, and anchor as desired.

The Eastern channel has a small 9-foot patch in mid-channel, thus narrowing the passage on either side to half a cable, and is not to be recommended; but during the north-west monsoon a leading wind will enable sailing vessels to pass safely in or out by this channel.

General charts 942a, 2759a.

Plan of Dilhi harbour on 1460. Var. 3° 0' E.

To enter it the barracks flagstaff should be brought to bear 183° true, which will lead in depths of 10 to 14 fathoms; then haul close round the white buoy on the eastern end of the reef, and steer towards the Governor's palace.

Dilhi town is situated in a low and very unhealthy position, much subject to fever, though in the adjacent hills the climate is salubrious. Both wheat and potatoes are grown, and sheep and ponies thrive. With the exception of Portuguese officials, very few Europeans reside here. The front street of the town is along the beach. There is a rather dilapidated hospital in the town, but a new one, airy and modern, with 48 beds, has been established in the hills, some forty minutes ride from the pier.

Trade.—The principal exports are sandalwood, horses, and wax; the imports are gunpowder, arms, salt, soap, liquor, ironwork, cloth, &c. Exports pay a custom duty of 5 per cent. on their value, imports from foreign countries 24 per cent., and Portuguese 15 to 20 per cent.

Pier.—Landing.—There is a pier off the Custom house with a frontage of 90 feet, with a depth of 8 fathoms at the outer end. Owing to a structural defect, it is only used by boats; vessels are not allowed to lie alongside it.

There is good landing almost anywhere; that recommended is to the westward of the pier, where there is a sandy beach and deep water. Along the beach is a row of trees, to which it is customary for vessels to make their sterns fast whilst discharging cargo.

Supplies.—Excellent beef, vegetables, and fruit are procurable in abundance, and there is a limited supply of bread. There is a standpipe on the beach between the two biggest trees; thence water can be taken on board any vessel made fast to the beach by means of her own hose. No coal is obtainable.

Communication.—Vessels of the Royal Dutch Packet Company call every four weeks on the Surabaya, Sunda islands, Timor route; and once a month from Makassar. The Eastern Australian Company's steamships call twice every three months, once on the northern and once on the southern journey.

Chart 942a, Eastern archipelago, eastern portion.

COAST.—Dangers.—A reef covered by 3 fathoms water lies one-third of a mile north of Tanjong Fatakoma. Between this point and Tanjong Subang, 14 miles to the eastward, four other reefs are shown on the chart, the outermost about 2½ miles from shore.

Tanjong Mantote and road (*Lat. 8°29' S., Long. 126°0' E.*).
—The road, 25 miles from Dilhi, is sheltered from westerly winds by

General charts 942a, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 3° 0' E.

the point, but information is wanting. Provisions may be obtained here.

Lamsana bay, south of Tanjong Mantote, is landlocked, and affords anchorage in 5 to 8 fathoms, sheltered from all but northerly winds.

Tanjong Lameh (*Lat. 8° 27' S., Long. 126° 22' E.*) lies 20 miles eastward of Tanjong Mantote; there is anchorage off Wemasi, 5 miles westward of the point, and also off Laga village, 10 miles south-east of the point. All the north coast of Timor, eastward of Tanjong Lameh, is bordered by a reef, reaching from one to 2½ miles off-shore.

The eastern end of Timor is high and the coast steep-to; it is crossed in a north-east direction by a rugged range of mountains, ranging in height from about 2,000 to 3,000 feet. View at page 308.

Nusa Besi, off the east point of Timor, is a small flat uninhabited island appearing as a tongue of land before it opens from Timor. The island is circular, 2½ miles in diameter, and wooded, the tops of the trees being 350 feet above the sea. A coral reef fringes the island, varying in width from a few yards on the western side to about 3 cables on the north and south sides. The channel between Nusa Besi and Timor is 4 cables wide and clear, with 10 fathoms in the narrow part. On the north side the depths gradually decrease, and good anchorage is found in 13 fathoms, sand and coral, 2 cables from the island, with the north point 96° true, and the east point of Timor 189° true.

Tidal streams run directly through the passage, at a maximum rate of 3 to 4 knots, and appear to continue longer north than south; strong rippings are then formed, and a heavy sea for boats.

The SOUTH COAST of TIMOR, is usually safe to approach within a moderate distance, and, beyond reefs projecting 2 or 3 cables from salient points, no off-lying dangers are known; there are, however, no bays or harbours which offer shelter in the easterly monsoon, and it is seldom visited.

General depths of 200 to 400 fathoms are found 3 to 5 miles off, gradually decreasing towards the shore, and only in a few places are there any sudden transitions from deep to shallow water. In the western monsoon considerable discolouration of the sea is seen, caused by the discharge from numerous rivers and streams; and in this season but little swell comes in, so that landing is nearly everywhere practicable.

There is no resident coast population, and only here and there are a few huts to be seen; inland, however, the hill sides are in many parts under cultivation.

General chart 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 3° 0' E.

The eastern part of the island is high and rugged, mountain ranges approach very near the coast, with a bold and rocky shore jagged and worn by the violence of the sea in the on-shore monsoon. Westward of this the land is of moderate elevation, terminating in low and sandy shores.

Coast.—A remarkable cleft in the hill is seen 14 miles from Nusa Besi; 5 miles south-westward, $1\frac{1}{2}$ cables off a sandy beach bordered with coral, 17 fathoms were found, with 26 fathoms, mud, a like distance outside.

Tanjong Batu Putih (*Lat. 8° 45' S., Long. 126° 53' E.*), a conspicuous light-coloured cliff from which the high land slopes steeply up, is 35 miles from Nusa Besi; from here, as far as a rather low and level point 25 miles south-westward, the coast curves strongly inwards.

Rather more than 3 miles northward of the latter point, off a reddish sandy beach, there is anchorage in 13 fathoms, mud, with a solitary hill 4,285 feet high, bearing 350° true, and a very conspicuous mountain of 7,881 feet, with a precipitous rocky summit (the highest in this part of Timor), 18° true. Three miles north of the anchorage is the mouth of a river.

The shore westward for 30 miles makes another inward curve, and is low with sandy beaches; 12 miles west of the point of this curve there is anchorage in 10 fathoms, mud and sand, half a mile off the mouth of a river with a few huts on the western side; eastward of the river a bank projects 2 or 3 cables from a low point. The water here deepens more rapidly seaward to 395 fathoms 3 miles off.

From the above anchorage to Tanjong Suai, 33 miles in a west-south-west direction, and for a considerable distance beyond, a hilly plateau 600 to 1,000 feet high slopes down to the sea, with many rivers and creeks.

Mota Masin, the boundary between the Timor territories of Portugal and the Netherlands, is in about the centre of Mau Besi bay between Tanjongs Tafara and We Toh. In the dry season the river is closed, but it is said to be navigable in the western monsoon. There is anchorage in 7 fathoms, sand and mud, southward of the Mota Wedieken, about three-quarters of a mile from the shore, which is low and densely wooded. About 5 miles south-westward is a wide mouth or delta, with some tall trees near.

Tides.—In Mau Besi bay it is high water, at full and change, about 0h., and the rise 10 feet.

We Toh, low and thickly overgrown with casuarina trees, is a projecting point of a belt of flat land extending from Mota Masin to Batu Merah.

General chart 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 3° 0' E.

Batu Merah, 43 miles south-west of Tanjong Suai, is high and rocky, with a few houses on the sandy shore northward. From the mountain range of about 2,000 feet spurs drop steeply to the sea, forming four conspicuous points; the two northern are red, and the two southern greyish white. Still further south is another white point.

Twenty-seven miles south-west of Batu Merah there is a low point, with a white sand beach on the east side, and a beach of reddish sand on the west. From this point the coast turns west towards Noi Mini bay.

Noi Mini bay is a comparatively slight incurve of the coast, about 20 miles across and 3 miles deep, with shores for the most part low, sandy, and broken by the mouths of several rivers. The whole bay is filled to a moderate depth with mud and sand thrown out by the streams, and there is anchorage in any part, the water gradually shoaling from 20 fathoms.

Batu Putih, the western point of Noi Mini bay, is a white cliff 225 feet high, and very conspicuous from an easterly direction (view at page 308). From the extreme of the point there is a broken shore of rocky points and sandy beaches for 2 miles northward, fringed with reefs. Nearly a mile north of the point there is a large detached mass of rock, and about $1\frac{1}{2}$ miles more north-eastward is the mouth of a considerable stream, fronted by a shallow bank.

Anchorage.—In strong westerly winds, there is good anchorage northward of Batu Putih in $4\frac{1}{4}$ fathoms, sand and mud, with the point bearing 199° true, the detached rock 339° true, and a bare rocky point 24° true.

Westward of Batu Putih the coast becomes higher and hills again approach the shore.

WETTA PASSAGE, separating Wetta island from Timor, is a wide, safe strait, used by vessels proceeding from Java to Australia.

Kambing island is 12 miles in length by about 5 miles in width at the southern end, $3\frac{1}{2}$ miles from which it rises to a height of 3,271 feet (*Lat. $8^\circ 16'$ S., Long. $125^\circ 34'$ E.*). It has a barren and sterile aspect, although some part of it appears to be under cultivation. The coast is exceedingly steep to all round, and free from reefs, except at the north point, where there are some patches of sandy beach and a reef extending about 2 cables from the shore. View at page 308.

The channel between Kambing island and Liran, west of Wetta, is $6\frac{1}{2}$ miles wide: the tide runs through this channel with considerable velocity, and frequently causes a turbulent sea with heavy tide-rips off the north point of Kambing and the south point of Liran.

Sumatra shoal, discovered by the Dutch man-of-war *Sumatra*, in 1853, and covered by 14 fathoms, is charted 20 miles, 100° true, from the north point of Kambing island, but the Dutch Sailing Direc-

General chart 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 3° 0' E.

tions place the shoal about $7\frac{1}{2}$ miles, 194° true, from this position; its position is uncertain.

Liran island, off the south-west point of Wetta, is $5\frac{1}{2}$ miles in length north and south, by about 2 miles in breadth, and is 1,415 feet high. The island is surrounded by a reef which extends for a considerable distance on the eastern side; the island Babi lies near the north-east point.

The passage between Liran and Wetta must not be attempted.

Anchorage.—Eastward of Liran there is good anchorage outside the reef in 16 fathoms, sand, with Babi bearing 353° true; and the south-west point of Wetta, 88° true. The only village on the island lies here; the natives are friendly, but no supplies are procurable.

Plan of south anchorage on 2468.

Anchorage may be had off the southern point of Liran, but the depths are very irregular, and vessels should not anchor in less than 20 fathoms.

Chart 942a, Eastern archipelago, eastern portion.

LIGHT (Lat. $8^\circ 5' S.$, Long. $125^\circ 42' E.$).—From a white iron framework, 66 feet high, on the south point of Liran island is exhibited a *white flashing light every five seconds*, 220 feet above high water, and visible 20 miles. The duration of the flash is *four-tenths of a second*. For the arc of visibility, see Light list.

Tides.—At Liran it is high water, full and change, at 1h. 30m.; springs rise 8 feet. The flood stream was observed to run to north-north-west and the ebb to south-south-east $2\frac{1}{2}$ to 3 knots two or three days after springs.

Nautilus reef, 3 miles northward of Liran island, partially uncovers, and is about 3 miles long in a north and south direction and one mile broad; no examination was made north of the reef, but apparently there is much foul ground off the north-west coast of Wetta between Liran and Honden island.

Wetta (Wetar) island, about 65 miles long and 20 miles wide, is lofty and well wooded. The inhabitants, who are fierce and treacherous, live generally amongst the mountains, and seldom visit the coast except in October, November, and December; "head hunting" is still practised.

The north coast is rocky, with precipitous mountain slopes and deep clefts, and there is no anchorage. Towards the east end is the village of Aramatta (Arawalla), half an hour's walk from the shore, where there is landing between two reefs extending a cable's length off, generally shown by discoloured water.

In the bight of the south-east coast there is reported to be a river, with a depth of 4 fathoms in the entrance.

General chart 2759a.

Plan of Ilwaki road on 2468. Var. 3° 0' E.

Ilwaki road (*Lat. 7° 56' S., Long. 126° 25' E.*), on the south coast of Wetta, westward of Tanjong Eddang Tutu (Edenkuku), the southernmost point, is an open bay with a coast reef a cable wide on the north shore, but deep water close up to the sandy beach on the eastern side. The anchorage is in 30 fathoms, sand. The posthouder resides at Ilwaki.

Communication.—Vessels of the Royal Dutch Packet Company call at Ilwaki every four weeks on the Surabaya, Sunda islands, Timor route.

Chart 942a, Eastern archipelago, eastern portion.

Coast.—The western part of the south coast is steep-to, and believed to be free from dangers. Tower hill, of 4,390 feet, the highest part of the island, rises over the coast 20 miles from the west point.

Gunong Api, 52 miles north of Wetta, is a conical volcano, 1,378 feet high; from the summit smoke is generally seen issuing. There is but little vegetation, and seabirds are numerous. It is steep-to, and may be approached with safety, but there is no anchorage.

For islands to the eastward, *see* Eastern Archipelago, Part III.

Plan of Tanah Jampea on 935.

ISLANDS AND REEFS LYING SOUTH-EAST OF SALAYAR.—**Tanah Jampea**, the largest of the group, is a high, rugged island, very broken on the west side, off which lie many smaller islands. The numerous summits are so nearly of the same height that they are difficult to distinguish except from westward, where the Peak of Jampea, 1,708 feet high, is a useful mark for avoiding Taka Kapalle. Kambangragi, a steep, rather pointed hill on the south side, 1,063 feet high, is a very good mark. In the west monsoon the atmosphere is remarkably clear, and from this neighbourhood the Peak of Bonthain, in Celebes, and the high mountains of Flores can frequently be seen. In the east monsoon the summits of the higher islands are generally hidden by dark clouds.

Tanah Jampea is sparsely populated, and almost entirely covered with dense forest, teeming with deer and also a few wild pigs. Of the islands under the west coast, Tanah Malalla is the largest, and is separated from the main island by Jalan Lupasang, a very narrow winding passage with a least depth of 3 feet at low water, and navigable for small vessels. Northward of Tanah Malalla are the small high islets Sarimpah, Katella, Sambio, Senapang, and Guru; there is a large village on Katella, where the Pungawa (chief) of Tanah Jampea resides. Bimbee, a saddle-shaped islet, 438 feet high, lies off

General charts 3616, 941b, 942a, 2759a.

Plan of Tanah Jampea on 935. Var. 2° 30' E.

the north-west point of Tanah Malalla, and further to the northward is the low coral islet Jainamoh, with the small fishing village Sisir on the south point.

Anchorage.—The wide bight on the north side of Jampea affords fair anchorage in 15 or 16 fathoms, with the islet Batu (*Lat. 7° 1' S., Long. 120° 45' E.*) in line with the highest peak of Kayuwadi island; close eastward of this mark is a reef of 3 fathoms water, and westward, a little nearer the coast, a reef of 4 fathoms.

Off the entrance to Labuan Kambangragi, on the south side of the island, there is anchorage in 15 fathoms, although there is little shelter here.

Labuan Kamajang, south-eastward of Tanah Malalla, affords anchorage in about 17 fathoms, probably safe in both monsoons; northward of the anchorage are two shoals with $2\frac{3}{4}$ and 3 fathoms water. Good water may be obtained from a rivulet at the head of the bay.

There is anchorage for small vessels in the bight eastward of Katella, where there is very good shelter in the west monsoon. The passage to the road, between Katella and the reef projecting from Sambio and Senapang, is $2\frac{1}{2}$ cables wide; the highest peak of Jampea, bearing 114° true, leads through this channel, taking care to avoid a small rock of $1\frac{1}{2}$ fathoms water lying 8 cables, 160° true, from the west extreme of Sambio. Provisions can be obtained at Katella.

Anchorage may also be found northward of Bimbee and Tanah Malalla, but this is unsafe in the west monsoon. In the passage between Jainamoh and Bimbee, give Jainamoh a wide berth. Lana Pasingka, a patch with 3 fathoms water, lies $1\frac{2}{10}$ miles north-eastward of Bimbee, and there is a patch, with 5 fathoms water, 6 cables further westward.

Chart 3616, Tomori gulf to Salayar strait.

Bank west of Jampea.—Vessels are recommended to keep westward of this extensive bank, outside the 100-fathoms line. Vessels, however, passing over it, should do so in the daytime, as the bottom can generally be seen in 15 fathoms. Westward of the meridian of Jainamoh the bottom is so irregular that the lead can give little indication of danger; eastward of that meridian the lead is a sure guide, and it is extremely unlikely that there are any further dangers than those charted.

Taka Kapalle (Vesuvius) are extensive reefs near the south-west corner of the bank, with a least depth of 2 fathoms over them.

Sane Sane reef lies on the north-west edge of the bank, and is nearly always dry; a fishing hut stands on the eastern side.

General charts 3616, 941b, 942a, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 30' E.

Bank north of Jampea.—A long narrow ridge of very irregular depths extends northward of Jampea, embracing Kayuwadi and the following islets:—

Plan of Tanah Jampea on 935.

Batu, a small rock covered with shrubs, with some smaller rocks round it; it is 108 feet high and very conspicuous, affording a good bearing point.

Panjang (*Lat. 6° 57' S., Long. 120° 47' E.*), a small oblong patch with trees on it about 90 feet high; it is surrounded by a reef, and is the extremity of a shallow ridge of 7 to 8 fathoms, with a shoal of one fathom on the north-western end. The island has a few, probably temporary, inhabitants.

Chart 3616, Tomori gulf to Salayar strait.

Kauna is a wooded sandbank, surrounded by a large reef, and separated from Kayuwadi by a narrow channel.

Kayuwadi, 11 miles northward of Jampea, is 5½ miles long in a north and south direction, and consists mainly of three hills; Dato Besar, the northern, is steep, pointed, densely wooded, and 960 feet high; the middle hill is flatter, and only 358 feet high; Dato Kechil, the southern, attains a height of 433 feet. At a great distance the two highest hills appear as separate islands. The chief of the island resides in Melambere, the northern village. The island is entirely surrounded by a steep coast reef, consisting of sand, coral, and stones; several reefs of one to 2 fathoms water lie off the west side.

Anchorage.—In the east monsoon there is anchorage off the village Melambere, steering for the highest peak of the island, with course 132° true; when a sounding of 100 fathoms is obtained the utmost caution is necessary, as the reef is very steep there, and almost at the same time the bottom will be seen in about 15 fathoms, and the anchor must be immediately dropped. The north point of the island will then bear about 90° true.

Channels between Kayuwadi and Jampea.—For crossing the ridge north of Jampea the passage between Kauna and Panjang is the most recommended, the only danger being the one-fathom shoal north-westward of the latter island.

Plan of Tanah Jampea on 935.

The passage between Panjang and Batu is not advised, as the ridge is broader here and the bottom more uneven. The passage along the north coast of Jampea, southward of Batu, is navigable, but there are two patches with 4 fathoms water.

There are peculiar rippings on the ridge joining Kayuwadi and Jampea, sufficiently strong to interfere with the steering of a vessel. Vessels can find temporary anchorage on several parts of the ridge, in the event of darkness setting in.

General charts 3616, 941b, 942a, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 30' E.

Kalao, about 16 miles in length, east and west, is a narrow, hilly island, higher at the extremities than in the middle; the western peak attains a height of 896 feet, and the eastern 1,102 feet. The coast is high, steep, and surrounded by a narrow reef. Except for the village Lambega (*Lat. 7° 20' S., Long. 121° 3' E.*), near the east point, the island is almost uninhabited.

Chart 3616 and plan of Bonerate anchorage on 935.

Bonerate lies off the east end of Kalao, with a safe channel between them. It has three flat hills, the highest, near the north point, being 492 feet. A few small islets, named Teterang, lie on the drying reef off the south-west point. The large village Bonerate, where the Dutch Government official resides, is situated on the west coast, Leja on the north coast, and Lagunri on the south-east side.

Anchorage.—A line of praus will generally be found anchored in about 5 fathoms off Bonerate, and westward of these, at three-quarters of a mile from the shore, there is safe anchorage in the east monsoon, in about 40 fathoms; a patch of one fathom water lies a little southward of the anchorage. A remarkable thick tree in the village and the flagstaff are useful marks entering the road. In the west monsoon safer anchorage will be found off Lambega, in about 40 fathoms.

Tides.—At Bonerate the tides, under all circumstances, are weak; the character depends entirely on the falling together of the moon's phases and declination. The double-daily character predominates about 1st February, 1st May, 1st August, and 1st November, when 0° moon's declination occurs about the same time as full and change; the single-daily character predominates about the second half of June and December, when the quarters fall about the same time as the greatest declination of the moon.

The double-daily tide gives springs 5½ days after full and change, with high water at IIIh. 30m., and a rise of 1½ feet; neaps the same interval after the quarters, with high water at IXh. 30m., and a rise of half a foot. In the second half of March and September the rise of springs increases to 2 feet, neaps are imperceptible; in the second half of June and December both springs and neaps rise about one foot.

The single-daily tide gives high water on 1st January at about IIh. a.m.; 1st April, VIIh. p.m.; 1st July, IIh. p.m.; and 1st October, VIIh. a.m., springs occurring six days after the greatest half-monthly declination of the moon, with a rise of about 1½ feet; neaps the same interval after 0° moon's declination, with an imperceptible range. About the second half of June and December the rise of

General charts 3616, 941b, 942a, 2759a.

Chart 3616, and plan of Bonerate anchorage on 935. Var. 2° 30' E. springs increases to $2\frac{1}{2}$ feet and neaps to $1\frac{1}{2}$ feet; about the second half of March and September the range of springs is imperceptible, and neaps rise $1\frac{1}{2}$ feet.

The above description of the tides is taken from the Dutch Sailing Directions, but as the observations were only continued for a year implicit reliance cannot be placed on them.

Chart 3616, Tomori gulf to Salayar strait.

Marianne reef (Taka Bassie), 6 miles south-eastward of Bonerate, is about 5 to 6 miles in length, east and west, and 3 to 4 miles broad; on the southern part are some rocks above water, and close southward is a detached reef of 2 fathoms water. No bottom at 95 fathoms was obtained half a mile from the south-west end of the reef.

Kayu Pangan lies about 7 miles east-north-eastward of Marianne reef, and consists of two small islets or rocks surrounded by a reef.

Kalao Toa rises to a height of 1,698 feet on the south-east side, and is visible from a great distance. The principal village, Guru Opa, is situated on the south-west point of the island, and may be recognised by some cocoanut trees.

Between Bonerate and Kalao Tua no bottom was obtained at 40 fathoms.

Cornelia road, south-east of the hill on Kalao Toa, has anchorage in 24 fathoms, sand and coral, 2 cables off-shore, and about one cable from the reef, but there is no shelter in the east monsoon and the bottom is very steep.

Madu island, 394 feet high, is separated from Kalao Toa by a clear channel 4 miles in width. The island is about 6 miles in length, but narrow, and high. A reef extends off either end.

Tanah Karompa, about 3 miles north-west of the north point of Kalao Toa, and 271 feet high, lies, with several other islets, on the south-eastern edge of an extensive reef of which little is known. On the chart it is shown as roughly circular, about 13 miles in diameter, and an islet, Sungi Sangeang, lies about 7 miles north-westward of the reef; according to the natives, there are dangers between this islet and the large reef of the Tiger islands.

Kauna or Posthorse island (*Lat. 7° 27' S., Long. 122° 1' E.*) is about 15 miles to the eastward of Kalao Toa island. A reef projects from its east end.

TIGER ISLANDS include numerous islets, banks, and reefs lying in a space almost wholly unknown, between latitudes 6° 23' and

General charts 942a, 2759a, 1263.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 30' E.

7° 5' S., and longitudes 120° 56' and 121° 20' E. According to report there are a large number of coral islets, nearly all covered with vegetation, surrounded by far-extending reefs, and visible at a distance of 8 to 12 miles.

Karompa is the northern island, and from hence the group extends 43 miles to the southward to Kassi Tallu. The reefs rise steeply from a depth of 100 fathoms.

Zwaan reef, 5 miles long in a north-westerly direction, dries in places, and is situated 10 miles to the eastward of Karompa island; in 1911 a large area of discoloured water was reported between these two.

Another large reef has been reported 5 miles southward of Zwaan reef, said to be 7 miles long and 6 miles wide, but on which the depth is not given.

A detached reef (*Lat. 6° 50' S., Long. 121° 29' E.*), reported by the *Richard Wale* in 1841, lies eastward of the group.

Plan of Kassi Tallu islands on 935.

Kassi Tallu islands are a group of low coral islands, situated about 4 miles south-westward of the southern end of the Tiger reef, extending, with their surrounding reefs, about 5 miles north-west and south-east. Anchorage can be obtained, in about 20 fathoms water, between the two north-western islands, but the bottom is uneven.

Chart 3616, Tomori gulf to Salayar strait.

Kamassi, 6½ miles north-westward of Kassi Tallu islands, is a dry reef about 1½ cables in extent. A patch with 4 fathoms water is charted 1½ miles north-westward of the reef.

Kabia or Baars island (*Lat. 6° 54' S., Long. 122° 13' E.*) is 123 feet high, and entirely surrounded by a coral reef.

There appears to be anchorage 2 cables west of the northern part of Kabia island; and on the east side between the main and a detached reef. Deep water has been found in discoloured places, 5 miles westward of the island.

General charts 3616, 942a, 2759a, 1263.

CHAPTER X.

SOUTH COAST OF BORNEO, FROM TANJONG BATU JURUNG TO
PULO LAUT STRAIT.

 VARIATION IN 1914.—Nearly stationary.

A description of the west coast of Borneo from Tanjong Sambar northward is contained in China Sea Directory, Vol. I., and will be in China Sea Pilot, Vol. II., new series. The present chapter treats of the south coast from Tanjong Batu Jurung to Pulo Laut strait.

The greatest caution must be exercised in approaching this coast as reefs extend many miles off in some parts.

Charts 941a, 941b, Eastern archipelago, western portion.

SOUTH COAST OF BORNEO.—The whole coast is of the same monotonous character, with no distinctive landmarks, being densely overgrown with woods of a moderate height; but at rivers mouths the trees are generally taller. The coast is almost uninhabited except for small villages by the mouths of the rivers.

In the western monsoon the discharge from rivers is very great, and discoloured water, edged with a streak of foam, will frequently be seen 30 to 40 miles from shore.

Tides, on the south coast of Borneo, are nearly always diurnal, but a second tide, of very small amount, may occasionally be seen. In November, December, and January, the highest water was observed, and the lowest in July and August.

Chart 2160, Carimata strait. Var. 1° 30' E.

Tanjong Batu Jurung (*Lat. 2° 38' S., Long. 110° 9' E.*) is high and rocky, whence a ridge of hills, culminating in a conical peak, 625 feet high, extends in a north-easterly direction, and forms the steep slopes of the southern bank of Sungai Kendawangan, the range terminating about 4 miles from the sea. Two islets, the northern and smaller named Tating, and the southern Iras, lie close off the point, and are steep-to on their western sides.

Chempedak, a low wooded island $1\frac{1}{2}$ miles westward of Tanjong Batu Jurung, has a rocky coastline except on the south-east side, where there is a sandy beach and a small native village. The island should not be closed to a less distance than 6 cables upon the seaward sides, as many detached dangers exist within that distance. There is a

General charts 941a, 941b, 1263.

Chart 2160, Carimata strait. Var. 1° 30' E.

channel between Chempedak and Batu Jurung, with depths of $5\frac{1}{4}$ to 8 fathoms, also between this island and Bawal, with depths of 6 fathoms.

Bawal or Kumpul is 6 miles long by 4 miles broad, thickly wooded, and low, with the exception of two small hills, the highest being 290 feet high, rising above the vegetation near the centre of the island; Tanjong Rotan, the west point, forms a bluff when viewed from south-west or southward.

Reefs extend about one mile from the north and west shores, and several islets and rocks lie upon the reef off the north extreme; upon the eastern side banks of hard sand lie parallel with the coast, extending a mile from it, and are steep-to. Patches of sand and stones both above and below water are found within 2 miles of the south side of Bawal, and foul ground extends to the Perantung islets.

Anchorage.—Sheltered anchorage in both monsoons may be obtained off the east side of Bawal, which may be approached by the channel between Chempedak and Tanah Merah (red rock), the northern islet upon the reef of Bawal. Rocks above water extend about $4\frac{1}{2}$ cables eastward of Tanah Merah.

Off the west side, which has a sandy beach, there is also anchorage, in 5 fathoms, with Tanjong Rotan bearing about 182° true, and the north extremity 75° true.

There appears to be an eddy tide near the island, as rising tide sets southward, whereas in the offing the direction is about north-north-west.

Water may be obtained on the island by digging above high water mark.

Corcyra bank (*Lat. $2^\circ 49'$ S., Long. $110^\circ 1'$ E.*), of 2 fathoms, is about 5 miles 198° true from the west point of Bawal, and another of the same depth lies nearly 2 miles north-eastward of the bank. A patch of $2\frac{3}{4}$ fathoms also lies 3 miles southward of Corcyra bank. The hill over Tanjong Batu Jurung open west of Bawal leads westward of these reefs.

A channel of $5\frac{1}{2}$ to 10 fathoms runs between Bawal and a mud flat extending from the Borneo coast; the southern part shoals to $3\frac{1}{2}$ fathoms, taking a south-south-west direction, and then westward between Perantung and Langau islets.

Gelam, north-westward of Tanjong Sambar, is about 4 miles in length and breadth, very low, and wooded. Foul and rocky ground extends 3 miles westward of Gelam to Langau islets and southward 11 miles, including Mangkut islet.

A reef, about 4 miles in extent, with a least depth of $1\frac{1}{2}$ fathoms, lies about 6 miles south-west of Gelam.

General charts 941a, 1263.

Chart 1964, Tanjong Puting to Tanjong Sambar. Var. 1° 30' E.

Tanjong Sambar (Lat. 3° 0' S., Long. 110° 18' E.), the south-west point of Borneo, is low, rocky, and has a large tree upon it, which is visible 4 miles farther than the neighbouring wooded land, or about 16 miles. Near the point are numerous rocks and stones above water.

Caution.—Between numerous sand ridges, extending more than 30 miles southward of Tanjong Sambar, currents run from 2 to 3 miles an hour with overfalls; vessels should pass well southward of these dangers.

Mangkut, 7 miles south-westward of Tanjong Sambar, has a remarkable high tree near its centre, and can be seen about 14 miles. A rock above water and a reef that dries at low water lie, respectively, 2 and 4 miles to the south-eastward of the islet; 2 miles to the north-eastward is Penambun, an islet with three large trees on it and surrounded by rocks. Vessels from southward should not attempt to sight Mangkut islet.

SHOALS off Tanjong Sambar.—**Linge shoal**, of hard sand, having a depth of one fathom, lies with Mangkut islet bearing 326° true, distant 13½ miles; the shoal is steep upon the northern side, but in other directions the water shallows gradually.

Chart 2160, Carimata strait.

From Linge shoal a narrow ridge, of less than 4 fathoms, runs west and north-westward for 20 miles; the least water, of 2 fathoms, is 8 miles, 197° true, from Mangkut islet. At the extreme of another ridge lying 11 miles westward from Linge shoal, there are only 2½ fathoms.

Clemencia bank, a ridge of hard sand 4 miles long, 20 miles, 194° true, from Mangkut islet, has about one foot water on its shoalest part, and is steep-to. Breakers are nearly always to be seen on the reef.

Eight miles east of the south end of Clemencia bank is another similar ridge of 2 fathoms.

Light-buoy.—A light-buoy, painted black, and exhibiting an *occulting white light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*; is moored on the western side of Clemencia bank.

Aruba banks, distant 23 miles 186° true from Mangkut islet, is a narrow bank 4 miles long, with 2 fathoms water, steep-to, and generally indicated by rippings.

Chart 1964, Tanjong Puting to Tanjong Sambar.

Fox shoal, with a least depth of 2 fathoms, is 27 miles 185° true from Mangkut islet. The shoal is nearly 2 miles long in a north-west direction, and is indicated by strong rippings.

General charts 941a, 1263.

Chart 1964, Tanjong Puting to Tanjong Sambar. Var. 1° 30' E.

Fox banks, with depths of 4 to 9 fathoms over them, extend for 10 miles to the south-eastward of Fox shoal.

LIGHT-VESSEL.—About 12 miles to the south-eastward of Fox shoal is a shoal of $2\frac{3}{4}$ fathoms, and to the southward of this a bank of 6 fathoms water; between both these latter a red light-vessel, with *Sambar* in white letters on the sides, exhibits an *occulting white* light every twenty-five seconds, thus:—light, fifteen seconds; eclipse, ten seconds, visible from a distance of 10 miles.

COAST.—**Air Itam (Ayer Hitam) bay**, between Tanjong Sambar and Tanjong Lumpur, 22 miles to the eastward, is shallow, the 3-fathoms line extending to 5 miles from the shore in some places, with the Mogung rocks on the edge of it near the middle of the bay. The Sungai Air Itam discharges at the head of the bay, but according to the natives there are only 2 or 3 feet water at the entrance at low tide.

Sungi Jelai, which enters the sea east of Tanjong Lumpur, has a wide but shallow entrance, marked by beacons; a steam vessel, drawing not more than 6 feet water, can reach Sukamara at high water springs in about 10 hours.

Buoy.—A black conical buoy, with staff and ball, is moored on the edge of the 3-fathoms line, southward of the mouth of the Sungai Jelai.

Tides.—It is high water, full and change, off the Sungai Jelai, at Xlh. 44m.; springs rise $7\frac{1}{2}$ feet.

Van Selaka bank.—Eastward of Sungai Jelai, a bank of coral and sand, 5 miles wide, with depths of one to $2\frac{1}{2}$ fathoms over it, and one place which dries, extends 15 miles from the coast, and should not be rounded in depths of less than 5 fathoms.

Kota Waringin bay is east of the above bank, between Tanjong Selaka and Tanjong Pengujan (*Lat. 3° 1' S., Long. 111° 33' E.*), and is very shallow towards the land. From Tanjong Pengujan, which can be distinguished by tall trees, a broad flat extends to the southward for 8 miles, with a few patches of $1\frac{1}{2}$ to 3 fathoms outside. The Beras basah banks, which are low and not easily seen, lie on the northern part of this flat.

Sungi Kota Waringin.—The channel at the entrance to this river has depths of $1\frac{1}{2}$ to 5 feet, and is marked by beacons; the average rise of tide is $5\frac{1}{2}$ feet. On the east side of the channel, just within the mouth of the river, are the islands Kelapa and Sumadra. About 12 miles up-stream the river divides into two branches, the eastern being named Sungai Arut; the village Suka bumi, with a popu-

General charts 941a, 1263.

Chart 1964, Tanjong Puting to Tanjong Sambar. Var. 1° 50' E.

lation of about 2,800, and the residence of the Rajah, is situated on the right bank of this branch.

Vessels may find anchorage off the Sungai Kota Waringin in $3\frac{1}{2}$ to 4 fathoms, mud.

Buoy.—A black conical buoy, with staff and ball, is moored on the edge of the 3-fathoms line of the mouth of the Sungai Kota Waringin, about 3 miles to the south-westward of Kelapa islet.

Kumai bay.—From Tanjong Pengujan the coast trends to the north-eastward for 10 miles to the mouth of the Sungai Kumai, and then turns to the southward, forming Kumai bay, which affords good anchorage in depths of 4 to 6 fathoms, mud.

On the western side of the bay are the previously-mentioned Beras basah banks, and a reef, about half a cable in extent, with 6 feet water, not marked by discoloured water, situated 135° true, $6\frac{3}{4}$ miles from Tanjong Pengujan; on the eastern the Sangora banks, lying about 6 miles from the coast, and to the north-eastward numerous shoals, including Sapagar bank.

Buoys.—A white conical buoy marks the west side of the Sangora banks; and a black can buoy the east side of the 6-foot reef.

Sungai Kumai, which discharges at the head of Kumai bay, has a very broad mouth, though somewhat obstructed by banks, which are beacons, the western side being the deepest. Inside the entrance the river deepens quickly, and off the village Kumai, at 13 miles from the entrance, there is anchorage in 6 fathoms; a vessel drawing 18 feet can lie alongside the pier, and with the assistance of hawsers can turn. Near the flagstaff is a small stream where fresh water can be obtained, the water in the river being always salt. Only fish, oysters, and cocoanuts can be obtained at Kumai. The river is navigable for 15 miles above Kumai for any vessel that can cross the bar.

Tanjong Puting (*Lat. $3^\circ 31' S.$, Long. $111^\circ 46' E.$*) is low, and bare of trees; the coast here turns sharply to the eastward. The 3-fathoms line lies at about 3 miles from the shore, and the points should not be rounded in less than 5 fathoms by day, or 8 fathoms at night; the lead must be in constant use.

Chart 3161, Tanjong Malatayur to Tanjong Puting.

Coast. — Between Tanjong Puting and Tanjong Siamok, at 44 miles to the eastward, is a bay with generally less than 5 fathoms and many shoals, the 5-fathoms line extending 12 miles off-shore.

Sungai Pembuang.—This river has a broad funnel-shaped mouth, a sandbank drying at low water, named Gosong Awing, dividing it into two narrow channels; the western one is beacons. At the entrance are only 2 feet of water, and in the south-east monsoon there is frequently a heavy surf on the bar. The principal

General charts 941a, 941b, 1263.

Chart 3161, Tanjong Malatayur to Tanjong Puting. Var. 2° 0' E.

settlement is Kuala Pembuang, on the western bank, inhabited by Malays, with a population of about 1,400.

Buoy.—A black conical buoy, with staff and ball, is moored off the western channel to the Sungai Pembuang, at a distance of $1\frac{9}{10}$ miles from Tanjong Siamok.

Tides.—By the mouth of the Sungai Pembuang the tide is mixed with a preponderating single-daily character.

The single-daily tide has high water on 1st January about VIIIh. p.m.; 1st April, IIh. p.m.; 1st July, VIIIh. a.m.; 1st October, IIh. a.m.; springs occur $1\frac{1}{2}$ days after the greatest declination of the moon, with a rise of 5 feet in the second half of June and December, and 3 feet in the second half of March and September; neaps fall the same interval after 0° moon's declination, with rises of 2 feet and half a foot, respectively, in the above months.

The double-daily tide has high water 6 hours after the moon's transit, with a rise of $1\frac{1}{2}$ feet; in the second half of March and December this increases to 2 feet about 5 days before full and change, 5 days before the quarters it decreases to one foot.

The highest water level is reached when the moon's transit falls 32 hours after the greatest declination of the moon, the lowest when that interval is 26 hours.

Sampit bay.—The outer part of this extensive bay, between Tanjong Siamok and Tanjong Bakai, affords good holding ground, but is little sheltered in the south-east monsoon. The west shore of the bay is chiefly composed of sandy beaches with scanty undergrowth, and in one part the white trunks of a dead forest are conspicuous. In the northern part is a smaller bay, between Tanjong Bandaran (*Lat. 3° 8' S., Long. 113° 2' E.*) and Tanjong Chemati, into which the Sungai Sampit flows.

Tanjong Bandaran is a long, narrow tongue of sand with a row of trees at the extreme; a sandbank extends from the point about 3 miles to the north-eastward, and is working out. The greater part of the inner bay is obstructed by mudbanks extending from the shore, and the part with depths of more than 3 fathoms is only about 2 miles broad.

Buoys.—A black conical fairway buoy, surmounted by a ball, is moored to the north-eastward of Tanjong Bandaran; to the northward are a black can buoy on the port hand, and a white conical buoy on the starboard hand, entering from seaward.

Directions for Sampit bay.—The eastern side of Sampit bay is free from danger after Tanjong Bakai bears southward of 90° true; Tantun island, a high tree on Damar, and some trees north

General charts 941b, 1263, 2759a.

Chart 3161, Tanjong Malatayur to Tanjong Puting. Var. 2° 0' E.

of the above point afford marks for giving the ship's position. The 5-fathoms line runs about $4\frac{1}{2}$ miles from the coast.

Entering Sampit bay from the westward, vessels must continue on an easterly course after passing Tanjong Siamok (at the mouth of the Sungi Pembuang) until Tanjong Bandaran bears west of 0° true, when the fairway buoy off the latter point may be steered for. This buoy must be left to starboard, and course then altered to westward until a large, square, white board on the left-hand bank of the Sungi Sampit bears 359° true; steering for it on this bearing will lead over the deepest part of the bar between a black can buoy and a white conical buoy.

Vessels leaving the Sungi Sampit at night steer 176° true to 184° true over the bar till a sounding of 5 fathoms is obtained, course is then altered to 86° true through the deepest part of the basin, in soundings of 7 fathoms and more; when a sounding of 5 fathoms is again obtained course is altered to the south-eastward, gradually holding to the southward.

Chart 941b, Eastern archipelago, western portion.

Sungi Sampit.—On the bar before the entrance to the Sungi Sampit is a depth of 8 feet at low water springs, but this increases to 3 fathoms at the mouth of the river. The river has been surveyed by the Netherlands Government for a distance of fully 53 miles, and is of good navigable breadth, free from dangers, and, owing to the continual development of trade, of some importance. It is beacons by ball and cross beacons, but without these the navigation presents no difficulty and directions are unnecessary.

The village Samuda is about 10 miles from the mouth; Palangsian, with houses built on rafts, lies along the right bank, 25 miles up; 7 miles further up is the town of Sampit, with a population of about 4,000 and the residence of the Contrôleur. The islands Hanaut and Lepeh are between Samuda and Sampit; as far as the latter town the depths vary from $2\frac{1}{4}$ to 12 fathoms, the breadth from 275 to 1,650 yards. The water of the river is fresh in both monsoons.

Supplies, including bread, can be obtained in small quantities at Sampit.

Chart 3161, Tanjong Malatayur to Tanjong Puting.

Tanjong Bakai (Lat. 3° 18' S., Long. 113° 21' E.), at the mouth of the Sungi Mendawai, can be easily distinguished by its high trees; a sandbank extends for about 2 miles to the southward, and southward of this, separated by a narrow channel, is the Gosong Schunjer.

The islands Tantun and Damar lie on a sandbank east of Tanjong

General charts 941b, 1263, 2759a.

Chart 3161, Tanjong Malatayur to Tanjong Puting. Var. 2° 0' E.

Bakai; the former island comes first into view when making this part of the coast owing to its high wooded slopes; north of Damar is the Selat Jeruju, the safest and deepest entrance to the Sungai Mendawai.

Batu Mandi and Buaja.—About 4 miles to the south-eastward of Tantun island is a group of rocks, Batu Mandi, the highest, being 36 feet above water; Buaja is larger, but only a few feet above water; 2 miles to the north-eastward are three rocks awash at low water.

The passage between these and Tantun island is clear, except a rock, awash at low water, 6 cables north-westward of Buaja.

Sungai Mendawai is a broad river, but can only be entered by vessels of any draught at high water; according to the Dutch Sailing Directions it is navigable for moderate-sized vessels as far as the village Samba, 170 miles from the mouth.

The deepest entrance, the Selat Jeruju, with 4 feet at low water, is entered from Sebangsan bay, and is beacons; vessels of not more than 7 or 8 feet draught can go through the southern channel, between Tanjong Bakai and Damar, at high water. Just within the mouth is the village Pegatan and the island Baning opposite; Burung island, to the northward, can be passed on either side.

Buoy.—A black conical buoy, with staff and ball, is moored off the eastern entrance (Selat Jeruju) to the Sungai Mendawai.

Tides.—By the mouth of the Sungai Mendawai the tide is mixed with a predominating single-daily character.

The single-daily tide has high water on 1st January, about VIIIh. p.m.; 1st April, IIh. p.m.; 1st July, VIIIh. a.m.; and 1st October, IIh. a.m.; springs are $1\frac{1}{2}$ days after the greatest declination of the moon, with a rise of fully 7 feet in the second half of June and December, and 5 feet in the second half of March and September; neaps occur the same interval after 0° moon's declination, with a rise of nearly 3 feet and one foot, respectively, in the above months.

The double-daily tide has high water nearly 6 hours after the moon's transit, with a rise of $2\frac{1}{2}$ feet, and about the second half of March and September, nearly 4 days before full and change, a spring tide, with high water at IIIh., and a rise of 4 feet.

The highest water level is reached when the moon's transit falls 29 hours after the greatest declination of the moon, the lowest when this interval is 23 hours.

When about the second half of March and September 0° moon's declination falls 5 days before the quarters, the range is reduced to a minimum.

Sebangsan bay, between Tanjong Bakai and Tanjong Malatayur (Lat. 3° 26' S., Long. 113° 36' E.), is 14 miles deep, but the 3-fathoms

General charts 941b, 1263, 2759a.

Chart 3161, Tanjong Malatayur to Tanjong Puting. Var. 2° 0' E.

line lies about 7 miles from the northern shore. On the western side are the previously mentioned Batu Mandi and Buaja rocks; on the eastern side a sandbank extends in a north-westerly direction from Tanjong Malatayur.

The Sungai Sebanggan enters the northern part of the bay, but is of little importance, the bank before the mouth making it difficult for vessels of any draught to enter. Inland is the Gunung Kaki, a saddle-shaped hill, 743 feet high, which in clear weather can be seen over the trees from Sampit bay.

Chart 3029, Tanjong Selatan to Tanjong Malatayur.

Coast.—From Tanjong Malatayur the coast trends in a general easterly direction to the Barito river, with no landmarks except by the mouths of the Kahajan and Kapuas Murung rivers, where the trees are higher and closer together. In clear weather the hills north of Tanjong Selatan may be seen.

Malatayur bank, with depths of a half to 3 fathoms, extends for 30 miles to the southward of Tanjong Malatayur, and to the eastward are a few patches of 2½ fathoms; the 5-fathoms line is 40 miles to the southward of the point.

Beacons. — A beacon, surmounted by a cross, placed about 1½ miles southward of Tanjong Sau, and a similar beacon about half a mile southward of Tanjong Chimantan, mark an inshore channel used by small craft.

Sungai Kahajan.—The mouth of this river is not readily seen from out at sea, on account of a bend just above the entrance; Tanjong Damaran (*Lat. 3° 20' S., Long. 114° 5' E.*), the eastern point, can be recognised by the high dark trees on it. The channel is not beaconsed, and the least depth over the bar is 5 to 6 feet over very soft mud.

Owing to the scarcity of good landmarks it is difficult to give very definite directions for entering the river. The greatest depth over the bar is obtained by steering for Tanjong Damaran, on the bearing 354° true, until Tanjong Tawas bears 80° true, then altering course to 340° true, turning gradually to the northward and north-eastward when the river opens between Tanjong Perawan and Tanjong Damaran; the depths here are 3 to 5 fathoms under the left bank. About 6 miles from the mouth is a Customs house, with flagstaff and landing pier; the village Pangkoh, with about 1,000 inhabitants, and a missionary station, is 18 miles up the river; more than 20 miles further is Pulang Pisau, from which praus can reach Banjarmasin through canals and the Sungai Kapuas Murung.

The Sungai Kahajan is navigable for vessels of 9 to 10 feet draught as far as the village Pahandut, 80 miles from the mouth; beyond this there are many very sharp bends, making it difficult for a vessel of any length to turn.

Tides.—At the mouth of the Sungai Kahajan the tide is mixed with a predominating single-daily character.

General charts 941b, 1263, 2759a.

Chart 3029, Tanjong Selatan to Tanjong Malatayur. Var. 2° 0' E.

The single-daily tide has high water on 1st January, about Xh. p.m.; 1st April, IVh. p.m.; 1st July, Xh. a.m.; and 1st October, IVh. a.m.; springs occur $2\frac{1}{2}$ days after the greatest declination of the moon, with a rise of fully 6 feet; neaps the same interval after the quarters, with a rise of $1\frac{1}{2}$ feet.

The double-daily tide has high water 5 hours after the moon's transit, with a rise of $2\frac{1}{2}$ feet.

The highest water level is reached when the moon's transit falls 58 hours after the greatest moon's declination, the lowest when this interval is 52 hours.

By the village Pangkoh, about 18 miles from the mouth, it is high water 2 hours later.

Sungi Kapuas Murung.—The bar of this river, at 9 miles eastward of Sungi Kahajan, is very shallow, and at high water it is barely possible for vessels of 12 feet draught to enter; a safer course for ships of this size is to steam up the Sungi Barito, and thence join the Kapuas Murung through the Sungi Pulau Petak. The latter joins the Kapuas Murung by the village Kuala Kapuas (*Lat. 3° 2' S., Long. 114° 24' E.*), the residence of a contrôleur, and in communication with Banjarmasin through a canal navigable by praus.

To enter the Kapuas Murung bring the village Chemara Lebat, which can be recognised by a group of casuarina trees and a single thick tree, on the bearing 352° true, and steer in on this course to a distance of 2 miles from the coast; from this position alter course to 308° true over the bar, holding slightly more to the westward when in deeper water; when Tanjong Sambas bears 30° true shape course towards the western bank.

Chart 941b, Eastern archipelago, western portion.

SUNGI BARITO, the largest and most frequented on the south coast of Borneo, 15 miles eastward of the Kapuas Murung, is navigable by ships drawing 12 feet, to the town of Banjarmasin, and for smaller vessels to a great distance northward; in the west monsoon vessels with a draught of $7\frac{1}{2}$ feet frequently reach Muara Teweh, in lat. 0° 55' S.

Between the entrance points of Burung on the east and Pedada Tua on the west, the width is 3 miles, but the navigable channel does not exceed half a mile; this contracts to half that breadth 5 miles within, which is maintained to Tamban island, opposite the mouth of Sungi Martapura.

The upper part of the Barito from the island of Tamban to Marabahan carries a breadth of between 400 and 500 yards, and from 200 to 300 yards up to Buntut, in lat. 1° 44' S. The depth to this point is very irregular, from 3 to 12 fathoms, and varies much with the

General charts 941b, 1263, 2759a.

Chart 941b, Eastern archipelago, western portion. Var. 2° 0' E.

seasons. At Muara Teweh the stream is 437 yards across, and the difference of water level between the dry and wet periods is 40 feet.

In the easterly monsoon the salt water comes up to Marabahan, and the flood is occasionally felt as far as Buntuk, but usually not beyond the Pulau Petak. At Banjarmasin the water is fresh in the westerly monsoon, but in the other season is salt for some miles above.

Sungi Negara falls into the Barito near Marabahan, and is navigable, to the town of Negara, by ships not exceeding 180 feet in length.

Sungi Pulau Petak is about 75 yards broad, and connects the Barito and Kapuas Murung, it joins the former about 20 miles above Marabahan.

Chart 3029, Tanjong Selatan to Tanjong Malatayur.

The Bar is a portion of the great bank extending westward for 60 miles to Tanjong Malatayur; the entrance of the channel into the river, in 2 fathoms, is 4 miles south of Tanjong Burung. The least depth over the bar is 6 feet, deepening to 3 fathoms $1\frac{1}{2}$ miles west of Tanjong Burung; thence northward for 6 miles 3 to 4 fathoms are found, and 4 to 8 fathoms beyond to the town of Banjarmasin. The material of the banks forming the bar is hard sand and mud.

LIGHT-VESSEL (*Lat. 3° 39' S., Long. 114° 31' E.*).—A light-vessel, painted red, with “*Barito*” in white letters on sides, is moored in 18 feet water, on the line of the light-buoys, 6 miles to the southward of Tanjong Burung. The vessel exhibits an *occulting white light every twenty-five seconds*, thus:—light, *fifteen seconds*; eclipse, *ten seconds*. It is visible from a distance of 10 miles.

Beacons and buoys.—The outer (Old) beacon, $2\frac{1}{2}$ miles south of Tanjong Burung, has a red conical topmark, with one horizontal white band. Lange Jan beacon, nearly 3 miles to the westward of Tanjong Burung, is of screw piles, with a white conical topmark, with one horizontal red band.

In the middle of the channel over the bar, $4\frac{1}{2}$ miles above the light-vessel, is a light-buoy, painted black, showing an *occulting white light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*. On the western side of the channel, nearly 2 miles further, is a black light-buoy, showing an *occulting white light every twenty-five seconds*, thus:—light, *fifteen seconds*; eclipse, *ten seconds*. As the channel is liable to shift, these buoys are moved accordingly.

Northward of Tanjong Burung, on the east side of the channel, off the old telegraph station, is a white conical buoy.

There are also a *fixed white light* on a beacon upon Tanjong Pulantan, an *occulting white light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*, from a beacon on Tanjong Telan, and a *fixed white light* from a beacon near Sungi Jingga besar.

General charts 941b, 1263, 2759a.

Chart 3029, Tanjong Selatan to Tanjong Malatayur. Var. 2° 0' E.

Directions.—After passing the light-vessel the light-buoys in line lead through the channel over the bar (the deepest water is 100 yards westward of the line between both light-buoys, and on this line from abreast the outer beacon), the light-buoys are then left on the port hand; by the inner buoy shape course 28° true, and pass the white buoy off the old cable-house on the starboard hand. Thence steer for the south point of Tempurung kechil until Tanjong Pulantan is abeam, Tanjong Telan should then be kept a little on the port bow; after rounding the latter point hold to the right bank of the river as far as the Sungai Jingga besar, from which a north-easterly course may be steered for the mouth of the Sungai Martapura. At the entrance to this river is a stake with board, on which “Martapoera rivier” is painted; this must be left on the port hand.

Signals.—The following signals are shown near the harbour office at Banjarmasin, and at the junction of the Martapura and Barito, to show when the fairway between these points is clear:—

By day: One ball.	} Fairway unsafe.
By night: One <i>red</i> lantern light.	
By day: One triangle.	} Fairway clear.
By night: One <i>white</i> lantern light.	

In this portion of the river a ship proceeding down has the precedence over a ship going up; it may not be navigated by sailing vessels between 6 p.m. and 5 a.m.

Tides.—At Banjarmasin the tide is mixed, with a predominating single-daily character.

The single-daily tide has high water on the 1st January, about XIh. p.m.; 1st April, about Vh. p.m.; 1st July, about XIh. a.m.; and 1st October, about Vh. a.m.; springs are 2 days after the moon's greatest declination, with a rise of 7 feet in the second half of June and December, and 5 feet in the second half of March and September; neaps are 2 days after 0° moon's declination, with a rise of 3 feet and one foot, respectively, in the above months.

The double-daily tide gives high water 6 hours after the moon's transit, with a rise of 2 feet.

High water levels are reached whenever the moon's transit occurs 43 hours after the moon's greatest declination; low water levels when this interval is 37 hours.

Banjermasin (*Lat. 3° 20' S., Long. 114° 35' E.*), the capital of the south and east coast Residency, and one of the oldest trading ports in Borneo, is on the right bank of the Sungai Martapura, 3 miles from its junction with the Barito, and about 15 miles from Tanjong Burung. The official or Dutch quarter is on the island of Tatos, which

General charts 941b, 1263, 2759a.

Chart 3029, Tanjong Selatan to Tanjong Malatayur. Var. 2° 0' E.

is little more than a mudbank, nearly covered at high water. The houses are built on piles, or floating rafts, and all communication is by the narrow channels which separate the streets, and which admit of the passage of small native boats. There are commodious barracks, a good hospital, club house, a general warehouse, &c., a large Bugis quarter on the east side of the town, and a thriving Chinese settlement on the opposite shore. The width of the river here is about 130 yards, and it is navigable during a large portion of the year for steamships, over a distance of 30 miles, to Martapura, a town of 4,000 inhabitants.

Population, of the town and neighbourhood, in 1905, numbered about 50,000, including 466 Europeans and 2,581 Chinese.

Trade.—Banjermasin (*Lat. 3° 30' S., Long. 114° 35' E.*) is the chief trading port of Dutch Borneo, and is visited annually by a great number of ships, many of large size. The chief exports are cocoanut oil, copra, gutta-percha, gums, rattan, sago, and wax. Imports, earthenware and glass, cotton goods, opium, petroleum, and rice.

Coal.—Only native coal is kept in stock. The sheds are west of the town, on the right bank of the Martapura.

Coal mines.—The Pengaron (Orange Nassau) coal field, which up to the present time is the only one regularly worked by Government, is situated on the right bank of the Riam-kina, the principal source of the Sungai Martapura, at a distance of about 57 miles above Banjarmasin. The average annual output has been over 5,000 tons. The coal burns with a clear large flame and gives great heat, but leaves many cinders on the fire-bars. The coke cakes a good deal, and fires require frequent cleaning.

Communication.—Vessels of the Royal Dutch Packet Company call every week at Banjarmasin, on the Singapore, Surabaya, Banjarmasin, East Borneo route; also every week direct from Surabaya and back. By the same company there is a service about every 16 days from Banjarmasin to ports on the south coast of Borneo, and a fortnightly service in the Barito and Negara rivers.

Telegraph.—There is telegraphic communication with all parts, a cable being laid to Java and a land line to Balikpapan.

Coast.—From Tanjong Burung the coast trends south for 35 miles to Tanjong Selatan, and is bordered by a bank one to 2 miles wide. The 5-fathoms line is from 2 to 6 miles off-shore. The Sungai Maluka discharges itself 3 miles eastward of Tanjong Burung, and is navigable for small vessels. The mouth of the Sungai Tabanio is 11 miles further to the southward, and has a least depth of 6 feet in the channel to the entrance at high water; it is navigable for small vessels as far as the village Kupang, the general place of trade for the natives of the

General charts 941b, 1263, 2759a

Chart 3029, Tanjong Selatan to Tanjong Malatayur. Var. 2° 10' E.
coast and interior. The village Tabanio lies on the left bank, near the mouth.

At a distance of 4 miles, 216° true, from the mouth of the Tabanio are two rocks with depths of $1\frac{1}{2}$ and one fathoms over them. The islet Datu lies close to the coast, about 7 miles to the northward of Tanjong Selatan. Close to the coast abreast Datu is Pandan hill, 310 feet high, and to the north-eastward the Bira mountains, which can be seen from the mouth of the Barito and provide a good landmark from all directions; the highest summit of these is 1,166 feet high. Four miles north-eastward of Tanjong Selatan is Tonggah, 251 feet high.

Tanjong Selatan (Silat) is the southernmost point of Borneo; the hills behind and the lighthouse provide very distinct marks for fixing the ship's position when rounding it. The 5-fathoms line to southward of the point lies nearly 2 miles from the coast.

LIGHT (Lat. $4^{\circ} 11' S.$, Long. $114^{\circ} 39' E.$).—A white group flashing light every ten seconds, showing two flashes of four-tenths of a second each; eclipse between flashes two and one-tenth seconds, between groups seven and one-tenth seconds, is exhibited, at an elevation of 107 feet above high water, from a white iron framework, 108 feet high, situated on Tanjong Selatan. It is visible from a distance of 16 miles. For the arc of visibility, see Light list.

Chart 941b, Eastern archipelago, western portion.

Shoals.—At a distance of $4\frac{1}{2}$ miles, 111° true, from the lighthouse on Tanjong Selatan, is a shoal of 3 fathoms, and $11\frac{1}{2}$ miles, 92° true, from the lighthouse, a depth of $4\frac{1}{2}$ fathoms.

Coast.—From Tanjong Selatan the coast turns in an east-north-easterly direction for 85 miles to Tanjong Petang, and is low, flat, and covered with high trees, chiefly casuarinas. Far inland the Meratus mountains run almost parallel with the coast, but the summits are generally hidden by clouds; the highest is 4,238 feet. A number of small rivers flow out on this part of the coast, the principal are the Senipah, Asam Asam, Satui, Ansana, and Sebemban.

Reefs.—Kuhurn reef lies about 5 miles from the coast, 47 miles eastward of Tanjong Selatan, and has a depth of 3 fathoms over it; 3 miles to the westward is a patch of 3 fathoms.

Vesuvius rock, awash at low water, lies to the southward of Sungi Satui, and about 3 miles from the coast; to the westward are two rocks, awash at low water.

Nine miles eastward of Vesuvius rock is a dangerous reef, about 54 yards in diameter, and nearly 4 miles from the coast; it is covered at high water, and the sea frequently does not break. To the southward of Tanjong Kandang Aur are a number of reefs, the outermost, about 4 miles from the coast.

General charts 941b, 1263, 2759a.

Chart 941b, Eastern archipelago, western portion. Var. 2° 10' E.

Betsy reef is on the edge of the 3-fathoms line, 3 miles south of Tanjong Batu, and dries at low water.

Wreck.—At a distance of 8 miles, 213° true, from Kuhn reef, is a wreck with not more than 2 fathoms water over it.

Directions.—The lead is a very safe guide when navigating between Tanjong Selatan and Pulo Laut strait, with the exception of the two shoals $4\frac{1}{2}$ miles and $11\frac{1}{2}$ miles eastward from the point; all the above reefs lie within the 5-fathoms line, vessels, therefore, should not sound a less depth than 6 fathoms. Mount Sumbawa (*Lat. 3° 39' S., Long. 116° 11' E.*), Pulo Laut, bearing 68° true, leads to the southward of all these dangers. Tanjong Petang light, page 346.

Duand shoal, of 4 fathoms, is shown in lat. 4° 31' S., long. 114° 50' E., but the position is doubtful.

Bampton bank, of 2 fathoms, is in lat. 4° 47' S., long. 114° 50' E., but this position is also doubtful.

Arends island, 52 miles southward of Tanjong Selatan, is about 4 miles in length, north-west and south-east, 337 feet high, level, thickly wooded, and uninhabited. A small islet named Tokang, with a rounded summit 250 feet high, lies south of it. Reefs extend one mile from the western side, 3 miles from the eastern side, and 2 miles from the south-west side. A reef, with fishing stakes, lies 3 miles 102° true from the south point, and a similar reef with stakes extends 3 miles westward of the north point of the island. A shoal of $4\frac{3}{4}$ fathoms lies $2\frac{1}{2}$ miles westward of the island.

A rock, on which an American ship struck, was reported to lie westward of Arends island, at about 9 miles distance; 17 fathoms have been obtained here, and the position of the rock is doubtful.

General charts 2637, 1263, 2759a.

CHAPTER XI.

MAKASSAR STRAIT.

VARIATION IN 1914.—Increasing about one minute annually.

Charts 2637, 2636, Strait of Makassar.

MAKASSAR STRAIT, the great channel east of Borneo, is 350 miles in length from the south point of Pulo Laut to Tanjong Mangkalihat (*Lat. 0° 59' N., Long. 118° 59' E.*), and generally from 150 to 100 miles wide, except where it is contracted, by the prolongation of the latter point, to 60 miles at the northern entrance. Between lat. 2° and 3° S. the strait is separated into two channels by the Balabalagan or Little Paternoster islands; the width of the western channel is 20 miles, and of the eastern 45 miles, but there are some dangers in the former, which is nevertheless much frequented, and for some reasons preferred to the other, having moderate depths along the coast of Borneo, whereas the coast of Celebes is steep-to in many places, and destitute of anchorage.

As this strait with the coasts on either side have not been in all parts accurately surveyed, it behoves every commander who passes through to use more than ordinary caution.

Winds.—In Makassar strait the monsoons are not so marked, and their strength is less than in the Java sea. As most passages through are taken on one or other side of the strait, it is essential to remember that near the shores land and sea breezes blow through the whole year, and that the direction of the coast, with local topographical features, may greatly influence the force and direction of the wind then blowing in the body of the strait. Land breezes may be expected between about 7 p.m. and 7 a.m., and sea from 10 a.m. to 5 p.m. Where the monsoon is strong on a lee shore, the land wind may not come off.

In April the easterly monsoon sets in, over the southern part of the strait, blowing from north-east to south-east, but calms and north-west winds are felt as well; this unsettled weather lasts until June, when the wind begins to blow with some regularity from the south-east quarter, occasionally shifting to south-westward; at night, in this month, the wind is mostly east to south-east, but frequently, also, south and south-west. These winds will bring in more or less swell, and, blowing in opposition to the prevailing southerly currents, produce a short and troubled sea.

General charts 941b, 2660b, 1263, 2759a.

Charts 2637, 2636, Strait of Makassar. Var. 2° 30' E.

In September and October wind and sea decrease, and changing through south and west, winds blow from north-westward, and in December from south-west to north-west, but cannot be relied on.

In January the monsoon is at its height, blowing from north-westward, with heavy squalls, much rain, and sea, which begin to abate in February, and in March there will be light breezes from north-west to north-east and east.

Rain falls most from December to March, but there are showers in all other months, the least in September.

Squalls and thunderstorms are most frequent in December.

In the northern portion of the strait, the wind force is still less, the monsoons—from northward and south-south-westward—are uncertain, and depend much on the strength of the several winds in China and Java seas; the seasons are feebly defined, with much rain.

South-south-west winds begin in May, veering occasionally to west and north-west, and blow somewhat unsteadily. From June to September the monsoon is at its height, and south-westerly winds prevail day and night. In October the monsoon decreases in force, and is lowest in November, the wind sometimes veering to the northward and north-eastward. In December the general direction is north-west, in January north, and in February north-north-east winds blow with some steadiness, decreasing in April, when calms and uncertain breezes are expected.

There is less cloudiness in the northern than in the southern part of the strait, but rain is heavier and more continuous, and, in all parts, the fall is greater on the Borneo than on the Celebes side.

Squalls and thunder are infrequent, but mist, a rare phenomenon in these regions, is often seen.

Currents in the main channels of Makassar strait are perennial, running to the southward at an average velocity of 17 miles in 24 hours, the highest record being 58 miles; in the south-easterly monsoon the stream is pressed to the south-west, and in the opposite season to the south-east. In the great bight of the coast, southward of Mangkalihat (*Lat. 0° 59' N., Long. 118° 59' E.*), there is often a considerable eddy in the opposite direction.

On the banks and in shallow waters, no rule holds, but the stream takes the line of deepest channel, and may be violently deflected by any obstruction.

After long continued wind, the surface drift is considerable, and may appear like a reversal of the prevailing set, but on a slackening of the wind force the normal current is resumed with increased speed, accelerated or retarded by the tidal streams.

In the Celebes sea, during the south-east monsoon, drift currents

General charts 941b, 2660b, 1263, 2759a.

STRAIT OF MAKASSAR.

Charts 2637, 2636, Strait of Makassar. Var. $2^{\circ} 10'$ E. from eastward will cause a gyrating motion, which increases the southerly set on the west side, and gives an easterly current along the north shore of Celebes.

Tides.—Except in the south-eastern part of Makassar strait the tide is mixed with a preponderating double-daily character, with the peculiarity of a half-daily rising at VIIh. a.m. and VIIh. p.m., and a similar fall about 1h. p.m. and 1h. a.m. Along the Borneo coast this phenomenon is most noticeable in the southern part of the strait, on the Celebes coast in the northern. In the north part, the tidal wave flood runs north, and ebb south. In the southern part, the tidal wave appears to enter from the Pacific. During calms, and in shallow waters near the land, tidal streams are well marked.

Chart 9416, Eastern archipelago, western portion.

ISLANDS SOUTH-EAST OF BORNEO.—**Little Pulo Laut or Lauriot,** a triangular group of three large islands and a few small ones, are high and rocky, and can be seen from a distance of 50 miles in clear weather. They are almost uninhabited, high; some detached rocks are on the south and west sides, but there is deep water around.

Kalambau, the south-western, is about 4 miles across, and 1,102 feet high; some detached rocks are on the south and west sides, but there is deep water around. They are almost uninhabited, high; some detached rocks are on the south and west sides, but there is deep water around.

Chart 2637, Strait of Makassar, southern part.

Mata Siri, the eastern and largest, is thickly wooded, and rises to a height of 1,378 feet. On the north-eastern side of this island is a bay named Telok Sungi, in which the depths decrease regularly from 14 to 6 fathoms, and which affords secure anchorage in both monsoons. Before the entrance are two islets, Pamelika (Lat. $4^{\circ} 45'$ S., Long. $115^{\circ} 52'$ E.) and Kunjit; the channel between these is clear. Good water may be obtained in the bay, the only place on these islands.

Half a mile off the east coast of Mata Siri is the islet Chondong, and off the southern point another small islet.

Moreses, or Siri islands, are a group of one large islet 968 feet high, and three smaller islets, all wooded, with two rocks 10 and 16 feet above water, lying respectively, three-quarters of a mile 183° true, and 14 miles 203° true from East islet.

The Brothers lie 22 miles to the eastward of the large Moreses island. They are two wooded rocks connected by a reef which dries at low water. The northern Brother is 144 feet high. Between the islands soundings of 15 to 20 fathoms were found.

General charts 9416, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 10' E.

Dwaalder island, 9 miles from the south point of Pulo Laut, and 203 feet high, is narrow, wooded, and visible at a distance of 15 miles; it appears in the form of a saddle when seen from the southward; from its eastern side a reef projects about 3 cables. A patch of 6 fathoms lies $1\frac{1}{2}$ miles 47° true from Dwaalder. Between Dwaalder and The Brothers there is a clear channel 10 miles wide.

LIGHT.—An occulting white light every four seconds, showing light two seconds, eclipse two seconds, is exhibited, at an elevation of 36 feet above high water, from a white framework tower, situated on the north extreme of Dwaalder island. It is visible from a distance of 6 miles. For arc of visibility, see Light list.

St. George bank, 6 miles to the eastward of Dwaalder island, is 2 miles long and over half a mile broad; with 5 to 10 fathoms over it, and 12 fathoms around.

Birah Birahan is one mile long north and south, and 335 feet high, with a broad flat top. On the north and west sides there is a narrow sandbeach, the south and east sides are rocky. The island is surrounded by a reef which projects nearly $1\frac{1}{2}$ miles from the west side. On the reef off the north-west point, and 2 cables from the point, there is a small sandy islet covered with casuarina trees. The west point of Semut on with the hill 620 feet high, north of Mount Sebakaw, bearing 2° true, leads $1\frac{1}{2}$ miles westward of the reef.

Knoop island (*Lat. $4^\circ 5' S.$, Long. $116^\circ 14' E.$*), 2 miles eastward of Birah Birahan, is a great rock, about one cable in diameter, covered with vegetation. On the north side there stands a tree 100 feet high. A rock, awash at low water, lies half a cable from the south-west side. At half a cable outside this rock the depth is 10 fathoms, increasing rapidly to 14 fathoms, mud and sand.

Semut, $1\frac{1}{2}$ miles from the shore of Pulo Laut, is an oblong island $1\frac{1}{2}$ miles long and half a mile wide. It has three small peaks, the northern and highest being 479 feet high. The east side rises precipitously from the sea, the west side is flatter. A coral reef surrounds it, projecting 4 cables from the north-west side.

Karamputan island, $1\frac{1}{2}$ miles north-east of Semut, and a little over 2 miles from the shore of Pulo Laut, is about one mile long and 466 feet high. The east and west points are rocky and steep, the north-west point is low and sandy. The coral reef that surrounds the island extends from 2 to 4 cables out from the north and west sides, but only half a cable from the south and east sides.

Channel.—Between Birah Birahan and Semut there is a good and safe channel. The east side of Karamputan island on with

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 10' E.

the large tree on Tanjong Seloka bearing 37° true until Knop islet opens out north of Birah Birahan, will lead in not less than 6 fathoms, nearly one mile north of Birah Birahan reef.

Tides.—There are two high and two low tides in the 24 hours, but at times the second tide is scarcely perceptible. Springs range 7 feet, neaps 3 feet.

Currents and tidal streams.—To the southward of Dwaalder island the monsoon currents are distinctly traceable, but to the northward of that island they are imperceptible. The tidal streams follow the direction of the coast, the flood drawing towards the north, and the ebb to the south.

PULO LAUT, separated from the south-east coast of Borneo by the strait of the same name, is about 55 miles long, north and south, and 20 miles broad in the middle, narrowing gradually towards the north and south extremities. The southern part is hilly, the northern is mountainous, rising to about 2,300 feet; the whole island has a monotonous aspect, and is densely wooded. The coast is fringed by a broad coral reef which dries at low water, making landing difficult. Coal is found in the northern part of the island, the working of the mines being principally in the hands of the natives.

Simblimbingan, the centre of the mining population, which includes 30 Europeans, is in telephonic communication with Kota Baru.

Mountains.—The Sebatung mountains, in the northern part of Pulo Laut, are the highest in the island, one of the summits attaining a height of 2,329 feet; close northward, by Tanjong Peman-chingan, is a conspicuous black hill that shows plainly against the surrounding bright green country. Sejaka hill, about 7 miles from the east coast, is 689 feet high, and conical. The Palo Palo mountains are on the western side of the island, the highest summit, Mount Jambangan, rises to a height of 1,621 feet, and is one of the most conspicuous in the island. Mount Sumbawa, in the middle of the eastern part, is 1,558 feet high, and surrounded by a chain of hills. In the southern part of the island are a number of hills, difficult to distinguish from each other; Sebakaw, the highest of these, is 801 feet above the sea, to the north-eastward is a 620-foot high hill, with a small dark tree on the summit; Chapee, near the south-west point of the island, is 531 feet high, and has a large dark wood on the top.

Coast.—**Kunyit** may be said to form the south point of Pulo Laut, being connected by a reef almost dry at low water, with islets on it. The south point of Kunyit (*Lat. 4° 6' S., Long. 116° 2' E.*) rises steeply from the sea to a height of 243 feet, the centre rises in a conical hill of 459 feet. Soundings of 8 fathoms are found at a

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 10' E.

distance of 2 cables south, but to the eastward the water is shallow, and at $1\frac{1}{2}$ miles 112° true there is a 3-fathoms shoal, three-quarters of a mile in length. An extensive bank, covered by 6 to 10 fathoms, with 11 to 14 fathoms around, lies 4 miles 282° true from the point.

Tanjong Layar is the southern end of a peninsula projecting 2 miles from Pulo Laut, and only connected with it by a strip of land 100 yards wide. The bay between Kunyit and Tanjong Layar is very shallow.

Tanjong Sarang Janak.—From Tanjong Layar the coast trends north-eastward for 8 miles to Sarang Janak, a thickly wooded point $2\frac{3}{4}$ miles to the northward of Karamputan island, and is bordered along this stretch by a reef about one mile in breadth. A rock covered with vegetation lies one mile north-west from Karamputan island. The passage inside of Semut and Karamputan islands is not navigable for ships.

Tanjong Seloka.—From Tanjong Sarang Janak the coast makes a curve to the northward towards a little hill 308 feet high; to the eastward of this hill there is a small river, the entrance to which is rendered very difficult by a reef 7 cables wide, which dries at low water; thence the coast trends to the north-eastward with another bight, to Tanjong Seloka (*Lat. $3^\circ 55' S.$, Long. $116^\circ 18' E.$*), a rocky point covered with high trees, forming the south-east point of Pulo Laut, which can be recognised at a great distance by two trees on it, 250 feet high.

The Soundings off the south point of Pulo Laut increase regularly from the shore, and the 7-fathoms line is almost parallel with the coast from Kunyit to Semut, Karamputan, and Tanjong Seloka. The 10-fathoms line passes outside Birah Birahan, and turns to the northward; off Tanjong Seloka it lies $1\frac{1}{2}$ miles from the shore.

Between Dwaalder and Pulo Laut soundings of 13 to 15 fathoms are found, bottom mud and sand; near the shore of Pulo Laut and near Dwaalder there is more sand, with small stones occasionally; between the islands and Tanjong Seloka the bottom is mud and sand outside the 10-fathoms line, and sand nearer the shore.

Coast.—From Tanjong Seloka the coast trends in a northerly direction for 11 miles, to Tanjong Alang Alang; midway between these points is a shallow bay, in the southern part of which is an unnamed island and the small village Kapal Pechah. Several islets lie on the coast reef, the largest being Balik island, off the village of Bajau.

Kapak island, surrounded by a broad sand-strip, and 102 feet high, lies $1\frac{1}{2}$ miles to the northward of Tanjong Alang Alang.

Sebuku island, off the east side of Pulo Laut, is 18 miles in length north and south, and high in the centre. Reefs project 2 miles

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 10' E.

from the south point, embracing the Aur islands. Gosong Mangkok, 2 miles from the north point, dries at low water; there is a depth of 8 fathoms in the passage between, but a strong current sometimes runs through Sebuku strait, the channel between Sebuku and Pulo Laut, is almost closed by a mudbank, on which there is only 6 feet at low water.

Between the north point of Sebuku and the north-east point of Pulo Laut there is an extensive bay, sheltered from all winds except those from north and east. On the east side of the bay, 3 miles from Tanjong Mangkok, lies Manti islet, covered with trees, with a drying sandbank about one mile to the westward. The soundings are regular to the watering place under the high land on the west side of the bay, where a ship may anchor in 6 fathoms, about $1\frac{1}{2}$ miles off-shore, with Manti islet bearing 137° true.

Tanjong Pemanchingan, the north-east point of Pulo Laut, has a reef round it, but deep water is found immediately outside.

Sambergelap islands (*Lat. $3^\circ 40'$ S., Long. $116^\circ 35'$ E.*), 13 miles east from the south point of Sebuku, are a group of four islets and some rocks. The largest, Sambergelap, is 2 cables in length, and has on its south-west part a very remarkable tree, visible at a great distance. Buton Butona, a small round islet thickly wooded, lies 2 cables westward, and Merali islet, a large rock with low trees, is 4 cables north; these three islets are connected by a reef which dries at low water. Balang Balangka, a thickly wooded islet a little over one cable in length, lies outside this reef, half a mile, 80° true, from Sambergelap.

The reef on the west side of this group is very steep-to, and at half a cable westward of Buton Butona the depth is 25 fathoms, mud; on the south side the reef extends further out, and at 3 cables distance the depth is 14 fathoms; the east side is also steep-to, with soundings of 18 fathoms at $1\frac{1}{2}$ cables distance; on the north side the depth is irregular, with 13 fathoms at 8 cables, increasing thence rapidly to 17 fathoms.

A bank with a least depth of 6 fathoms, and 20 fathoms, mud bottom, around, is 8 miles, 102° true from Sambergelap islands.

West coast of Pulo Laut.—From Kunyit the west coast of Pulo Laut trends in a general northerly direction, to the southern entrance of Pulo Laut strait. To the village Sebanti, 9 miles northward of Kunyit, at the mouth of a small river of the same name, the coast rises steeply to a line of hills, and is partly fronted by a narrow sandy beach. The 5-fathoms line runs here at $1\frac{1}{2}$ miles from the coast, and this distance gradually increases to $2\frac{1}{2}$ miles off Tanjong Lauran.

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 10' E.

Tanjong Kalidupan (*Lat. 3° 54' S., Long. 116° 3' E.*), 10 miles north of Kunyit, is thickly covered with high trees; the round islet Tokong, which from westward has the appearance of two small islets, lies on the coast reef 3 cables to the south-westward of the point, with numerous rocks above water. A rock, which covers at high water, lies $4\frac{1}{2}$ cables, 296° true, from Tokong. Mount Semiaran in line with Tanjong Lauran, bearing 0° true, leads one mile to the westward of this rock, in $5\frac{1}{2}$ fathoms.

Tanjong Karambu, $3\frac{1}{2}$ miles to the northward of Tanjong Kalidupan, is also thickly wooded; between these points the drying part extends from 5 to 8 cables from the coast, with 3 fathoms at the edge.

Tanjong Lauran is formed by a salient rocky hill, covered with tall straight trees with white trunks; the hill is 266 feet high, can be seen from a great distance, and is one of the most remarkable points on the coast. Tanjong Semisir, $3\frac{1}{2}$ miles to the northward, is rocky, and thickly wooded; two round-topped trees on it are conspicuous when seen from southward.

Plan of Pulo Laut strait on 2662.

PULO LAUT STRAIT, between the south-east coast of Borneo and Pulo Laut, is well lighted, so can be navigated by night. The channel for large vessels is between Tanjong Petang and the bank eastward, east of Kramat bank, Suangi and Tampakan islands, and along either side of the Gusong Payung, although the eastern passage is preferable. The channel is very narrow in parts, especially eastward of Suangi island, where also is the least depth of water, viz., 19 to 25 feet. Views at page 346.

Western side of the strait.—The Borneo coast consists mainly of low land, thickly wooded, with high trees growing into the water. By Tanjong Kramat the Sungai Pegatan discharges, and about three-quarters of a mile to the southward is a conspicuous white house, surrounded by cocoa palms.

From Tanjong Kramat the coast runs with a slight curve to Tanjong Kresik Putih, off which is a small strip of sand, and one mile to the southward the village of the same name; close by the point is the mouth of the Sungai Merah, and 2 miles further northward the Sungai Batu Lichin discharges. On the south bank of this latter river is the town of the same name, where the Rajah of the district has his residence.

Further north a narrow river cuts off a portion of the mainland, known as Burung island, 3 miles in length. From Burung the coast

General charts 2637, 941b, 1263, 2759a.

STRAIT OF MAKASSAR.

curves of Pulo Laut strait on 2662. Var. $2^{\circ} 10' E.$
 Between Tanjongs Langadi and Dewa lies a very extensive mud-
 bank, which dries over a considerable length; between the parts that
 dry there are two blind passages over 3 fathoms in depth, scoured out
 by the water from the Sungi Sarungan.

LIGHT (Lat. $3^{\circ} 57' S.$, Long. $117^{\circ} 57' E.$).—From a lighthouse
 situated on the extremity of Tanjong Petang, is exhibited, at an
 elevation of 62 feet above high water, a white flashing light, showing
 a flash of four-tenths of a second every five seconds. It is visible from
 a distance of 14 miles.

Eastern side of Pulo Laut strait.—Tanjong Kiwi, at the
 southern entrance to the strait, is a salient rocky point, with a con-
 spicuous white house close to the southward. The coast here rises to
 the high land of the Palo-Palo mountains, and by the foot of Mount
 Semiaran is rocky; northward of this is a strip of mud and sand, with
 trees standing in the water.

On the north-westerly slopes of the Palo-Palo mountains lies the
 village Salino, and 2 miles northward the village Serdang, by the
 point of that name. From here the coast runs to the north-north-
 eastward for 12 miles, to Tanjong Ayun, with the mouths of several
 rivers between, and the large village Selukutan.

Setagin lies between the two rivers of that name, and it can
 be shipped at the rate of 4,000 tons of coal are usually in stock, and it can
 in length, with a depth of 500 tons a day. The coal wharf is 100 feet
 mine with the wharf; thence the coal, which is equal to the best
 picked Japanese, is transferred to the vessel alongside by hand.

Two mooring buoys are laid out off the head of the coaling wharf.
Supplies.—Fresh provisions are plentiful, and can be obtained
 by arrangement (which can be made by telephone from the pierhead)
 with the manager of the mine. Fresh water is brought by a pipe
 from the source of the river, and is supplied by the coal company.
Kota Baru, the most important place in Pulo Laut, and the
 seat of the Civil Government, which is vested in a contrôleur, stands
 on the north-western slope of the Sebatung range, fully 2 miles south-
 west from Tanjong Kemuning. It is a flourishing town, with
 a bazaar, kept chiefly by Chinese. General charts 2657, 941b, 1263, 2759a.



Pegalan village.

Suangi.

Sebatung mountains.



Palo Palo mountains.

Tanjung Petang,
bearing 34° true, 4 m.



Mt. Jambangan.

Mt. Semiaran.

Pulo Laut strait, south entrance.



Tanjung Mangkok.

Sebiku.

Mt. Sumbawa.

Tanjung Pemancingan,
Black hill.

Sebatung mountains.



Black hill.

Tanjung Langadi.

Pulo Laut strait, north entrance; Tanjung Dewa, bearing 272° true, 3 m.

Plan of Pulo Laut strait on 2662. Var. 2° 10' E.

be obtained. A mole, 825 feet in length, is carried out to near the 3-fathoms line, and makes access to the shore practicable at all times.

LIGHTS.—A *white flashing light every five seconds* is exhibited, at an elevation of 220 feet above high water, from a white skeleton iron framework, 66 feet high, on Balingkar hill (*Lat. 3° 14' S., Long. 116° 13' E.*), near Kota Baru. It is visible from a distance of 18 miles. For the arc of visibility *see* Light list.

A *red fixed light*, visible 7 miles, is exhibited from the end of the mole.

Anchorage.—The best anchorage is abreast the pier, about 2 cables from it, in 5 fathoms water. With persistent winds from north and north-east there may be some swell in the roadstead, which is, however, lessened on the land wind setting in from either side.

Weather.—As a rule, there is fair weather in the morning; towards evening the sky becomes clouded, and often a rain squall may be expected from one point or another, after which the weather clears again.

Supplies.—Refreshments can generally be procured. Water is brought into the town by a pipe from a spring at the source of the Sungai Baru; boats can obtain it by leading a hose to a hydrant.

Coal is floated down the river from the mines in praus of 4 to 6 tons burden on the Sungai Jilapat, about 2 miles south-west from the town; the praus can only get out of the river at half tide. The mouth of the river can be distinguished by a beacon with a black and white top, and two screens on a high tree on the eastern bank of the river. The price of the coal is 9 guilders per ton. There is anchorage at 1½ cables from the mouth of the river.

Communication.—Vessels of the Royal Dutch Packet Company call every week from and to Surabaya and Singapore.

Tides.—The tide at Kota Baru is mainly double-daily. The double-daily spring tide falls fully 2 days after full and change, with a rise of nearly 7 feet about the second half of March and September, and nearly 5 feet about the second half of June and December, and has high water at VIIh. Neaps fall 2 days after the quarters, with high water at the same time, and a rise of 2 feet in the second half of March and September; about the second half of June and December the rise is inappreciable.

About the second half of March and September the times of high water of the double-daily tide vary between Vh. and IXh.; low water between XIIh. and IIIh.

The single-daily tide has high water on the 1st January, about Xh. p.m.; 1st April, about IVh. p.m.; 1st July, about Xh. a.m.; and

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Plan of Pulo Laut strait on 2662. Var. 2° 10' E.

1st October, about IVh. a.m.; springs occur one day after the moon's greatest declination, with a rise of nearly 5 feet in the second half of June and December, and nearly 3 feet in the second half of March and September. Neaps the same interval after 0° moon's declination, with a rise of nearly 5 feet in the second half of June and December, and one foot in the second half of March and September.

The high waters of both spring tides do not fall together, but the contrary is the case with the low waters; the lowest water level is reached when full and change is one day before the greatest moon's declination, about the middle of May and September, at about Ih. a.m. and Ih. p.m. When full and change falls one day before 0° moon's declination, the tide, in the second half of March and September, is purely double-daily; when this occurs in the second half of June and December, the tide is single-daily, with a rise of almost 5 feet. When the quarters fall one day before 0° moon's declination, the tidal movement is weak, in the second half of March and September purely double-daily, with a rise of 2 feet; in the second half of June and December single-daily, with a rise of nearly 3 feet.

Coast.—To the northward of Kota Baru the coast is rocky, with coral in places, especially between Tanjongs Kemuning and Peman-chingan; near the latter point there are many rocks.

Light-buoy.—A black light-buoy, exhibiting a *white occulting light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*, is moored about one mile to the north-eastward of Tanjong Kemuning.

Islands and banks.—The southern entrance of the strait, although 2 miles wide from shore to shore, is considerably narrowed by two great sandbanks and a number of smaller ones, between which and the coast there are three fairways, the western being the most practicable and frequented. On the western bank, the least depth is 12 feet on the northern part, the north point lies about one mile, 77° true, from Tanjong Petang (*Lat. 3° 37' S., Long. 115° 57' E.*). On the north point of the eastern bank, three-quarters of a mile west of Tanjong Kiwi, are depths of 9 feet. Both banks extend fully 4 miles southward, and consist of mud and sand.

The channel between the great mudbank off Tanjong Petang and the west bank gradually narrows towards the north: but abreast of the point, where it is narrowest, it is still nearly 4 cables wide.

Light-buoy.—A white light-buoy, exhibiting an *occulting white light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*, is moored opposite Tanjong Petang, on the north-western side of the bank, at the entrance to Pulo Laut strait.

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Plan of Pulo Laut strait on 2662. Var. 2° 10' E.

Kramat bank.—The south end of this bank lies a little to the northward of Tanjong Kramat, and extends nearly 3 miles in a northerly direction, with a width a little over 2 cables; a small portion dries at low water springs; on either side of the bank there is a good fairway, but the eastern is preferred.

Buoys.—The ends of Kramat bank are marked by black can buoys Nos. 1 and 2, surmounted by truncated cones, indicating the western side of the eastern fairway.

Light.—A *red fixed* light, visible 2 miles, is shown at an elevation of 8 feet from Tanjong Kramat; it is exhibited from a white standard surmounted by a board with the word “Kabel” in black letters.

Telegraph cable.—A telegraph cable crosses the strait from Tanjong Kramat.

Suangi island is 2 miles long, by one mile wide, and rises to a height of 518 feet above the sea. The northern and southern slopes are shelving, the others are steep-to. On the south-eastern slope stands a very remarkable tree, which is a good mark for the navigation of the southern part of the strait. The island is overgrown with high trees down into the water; the southern part is rocky.

Anak Suangi is a small thickly-wooded islet close under the east side of Suangi. On the projecting bank a rock, awash at low water, lies $1\frac{1}{2}$ cables east of the islet.

LEADING LIGHTS.—Rear light (*Lat. 3° 27' S., Long. 116° 1' E.*).—A *white fixed* light is exhibited, at 154 feet above high water, from a white iron framework, 23 feet high, situated on the south-east part of Suangi, and should be seen from a distance of 17 miles.

Front light.—At 1,200 yards, 32° true, from the above light, a *white fixed* light is exhibited, at 36 feet above high water, from a white skeleton iron tower, 34 feet high, situated on Anak Suangi, and should be seen from a distance of 10 miles.

For their arcs of visibility, *see* Light list.

The above lights in line, on the bearing 212° true, lead in the channel abreast Tampakan and Gusong Payung, until northward of the Sungai Sambaluan.

Suangi bank.—Eastward of Suangi, on the eastern side of the fairway, is an extensive dangerous bank, consisting of mud, sand, small stones, and shells, that extends from three-quarters to $1\frac{1}{2}$ miles from the coast of Pulo Laut. A small part, eastward of the north point of Suangi island, dries at low water, and, near the south end is a rock awash at low water.

From the north point of Suangi a sand-flat, with a depth of about 2 fathoms, extends to Tampakan island, closing the old channel westward of Suangi.

Caution.—Several shoals of 12 to 18 feet water are charted in the channel east of Suangi. The bottom here is very uneven, and

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Plan of Pulo Laut strait on 2662. Var. 2° 10' E.

although it has been closely sounded, it is possible that further shoals may exist.

Light-buoys.—A white light-buoy, exhibiting a *white occulting light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*, is moored on the eastern side of the channel, abreast the southern end of Suangi.

A black buoy, showing a *red fixed light*, marks the edge of the reef eastward of Anak Suangi.

A white buoy, exhibiting a *green fixed light*, on the western side of a rock, with 12 feet water over it, is moored $6\frac{1}{2}$ cables, 57° true, from Anak Suangi light.

Tampakan is a low, thickly-wooded island, 2 miles long and nearly one mile broad; on the south side there are two very remarkable trees. A shoal, dry at low water, projects one mile to the south-west. To the northward the bank dries out half a mile, and is shallow for one mile off; westward of this there is a blind lead of 5 fathoms depth into the mudbank eastward of Burung.

Selukutan rock, 7 cables 340° true from Selukutan, is a dangerous rock which dries at low water; the 3-fathoms line here runs at some distance from the Pulo Laut shore, but further north it is very close under that shore.

Gusong Payung is a great sandbank which dries at low water; the south point of the bank is a mile eastward of the north point of Tampakan. There is a good fairway both eastward and westward of the bank, but the eastern is preferable.

The south end of the bank is marked by a black beacon with triangle.

Light-buoy.—A black light-buoy, exhibiting a *white occulting light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*, marks the eastern side of Gusong Payung.

Tidal streams.—As a rule the flood stream sets north and the ebb south, but it frequently happens that the contrary is observed, especially in the northern part of the strait. The stream runs with a velocity of $1\frac{1}{2}$ to $2\frac{1}{2}$ knots.

DIRECTIONS for Pulo Laut strait (*Lat. $3^\circ 35'$ S., Long. $116^\circ 3'$ E.*).—From southward the best mark for making the strait is Mount Jambangan, which should be kept a little on the star-board bow while steering for the entrance. Tanjong Petang, when recognised by the lighthouse, may be steered for, bearing 24° true, in not less than 4 fathoms, and when the light is favourable the position may be determined by cross bearings of the white houses near Tanjongs Kramat and Kiwi.

Near Tanjong Petang the depth increases to 10 and 12 fathoms, afterwards decreasing to 6 and 7 fathoms. The bank on the eastern side of the channel is marked by a white light-buoy on its north-

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Plan of Pulo Laut strait on 2662. Var. 2° 10' E.

western side, to be passed on the starboard hand. A course 34° true should be steered on a remarkable little sharp peak, one of the most northerly of the Palo-Palo hills, until the conspicuous tree or the lighthouse on Suangi island (*Lat. 3° 26' S., Long. 116° 1' E.*) bears 10° true, and must be steered for on that course, passing eastward of the two black buoys on the extremes of Kramat bank. There is also a clear passage westward of the above bank, but it is very narrow opposite the mouth of the Sungai Pegatan, and there is frequently a confused current.

Entering the channel east of Suangi island, the white light-buoy, abreast the south end of the island, is left on the starboard hand, and the black light-buoy on the edge of the reef off Anak Suangi on the port hand; hauling round the latter buoy, and leaving the white light-buoy to the northward on the starboard hand, to bring the two light-towers in line astern, bearing 212° true. This mark leads westward of Selukutan rock, and eastward of the beacon on the south point of Gusong Payung.

When abreast the mouth of the Sungai Sambaluan, alter course to 16° true, leaving the black light-buoy east of Gusong Payung on the port hand. From Tanjong Ayun to Tanjong Langadi the course is 60° true, thence a course 50° true will lead out of the strait, leaving the black light-buoy off Tanjong Kemuning on the starboard hand.

From northward the Sebatung mountains can be seen from a great distance, and course may be shaped to pass about 2½ miles southward of Tanjong Dewa. When past Tanjong Ayun and the light-buoy east of Gusong Payung, the two light-towers in line, 212° true, will lead in deep water to Suangi, and when the black light-buoy is 179° true, steer to pass eastward of this buoy, and westward of the southern white buoy; then proceed east of Kramat bank, with the tree on Suangi bearing 10° true, and passing close westward of the light-buoy abreast Tanjong Petang, leave the strait on a course 204° true.

At night.—Entering from the southward with the *flashing* light on Tanjong Petang 24° true, when abreast the point steer 34° true, leaving the light-buoy on the north-west side of the bank at the entrance on the starboard hand, and for Suangi light when bearing 10° true; pass between Suangi and the first *white* light-buoy, and close eastward of the *red* light-buoy, then bring the two lights on Suangi in line astern, 212° true, leaving the light-buoy with a *fixed green* light and Selukutan rock on the starboard hand. The light-buoy east of Gusong Payung is sighted at about 5 miles distance, and course must be altered more to the northward to leave it on the port hand, steering for Kota Baru light when it bears 60° true, and from abreast Langadi point a course 50° true may be taken out of the strait.

There is good anchorage everywhere in the strait, the bottom consisting of mud and sand, except around Suangi island, where it is rocky.

Chart 2637, Strait of Makassar. Var. 2° 10' E.

The EAST COAST OF BORNEO, northward of Pulo Laut strait, is low, marshy, and everywhere covered with vegetation; there are many bays and rivers, some of them of considerable magnitude. As a rule the ooze-laden water from the rivers will render the sea turbid for 8 or 9 miles off-shore, so that reefs can seldom be sighted by any change of colour. In the rainy season this troubled water may extend out for 12 miles, and beyond that distance only those dangers are readily seen which are composed of light-coloured coral, or when white sand is found amongst the heads.

There are few prominent landmarks, the coast hills seldom come within 6 miles of the shore, and vessels passing along this coast should not stand into less than 5 fathoms water.

The land is thinly inhabited, and villages are generally found only within the principal bays.

The great bank of comparatively shallow water, which extends east from the north point of Pulo Laut for 130 miles, bends in towards the Borneo coast in lat. 2° 0' S., where it is 50 miles wide, narrowing thence northward until it becomes lost on the south side of Tanjong Mangkalihat. The shore banks are covered with a thick stratum of river mud, which is generally absent from the raised reefs.

Plan of Kelumpang bay on 3031.

Kelumpang (Klumpang) bay, immediately north of Pulo Laut strait, runs north-westward into the land for 15 miles, with a depth in, over the entrance flat, of $3\frac{3}{4}$ fathoms. Within the entrance points there is a lane of deep water some 10 miles in length, and from a half to one mile in breadth, with 5 to 10 fathoms; the bottom over the inner part is mud and sand, outside it is mixed with stones.

Over Tanjong Dewa, the south point of the bay, a hill rises to 242 feet. From this point three islands project nearly 3 miles northward, Nangka besar, the middle and largest, having a conspicuous tree near the summit. On this island are coal mines, and coal can always be taken in from the quay. Tabuan and Nangka kechil are the other islands; there is also Burung islet. To the northward of Tabuan are two rocks with $2\frac{1}{2}$ and 2 fathoms water over them, and to the north-eastward a patch of 3 fathoms.

Tanjong Batu, the north entrance point, is 8 miles to the north-north-westward of Tanjong Dewa; there is a village and flagstaff (Lat. 3° 1' S., Long. 116° 13' E.) on the south end, and a high tree with white trunk, stands half a mile north-eastward. From the point the edge of the north bank runs out in an east-south-easterly direction for 8 miles, and on the bank, $3\frac{1}{2}$ miles from Tanjong Batu, is Gosong Karbau, a group of rocks, with less than 6 feet water; the channel

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Plan of Kelumpang bay on 3031. Var. 2° 10' E.

in, about one mile in width, is between this bank and the shoals extending from Tabuan. There are also passages between Nangka kechil, Nangka besar, and Tabuan, but they are very narrow, and a strong current runs through.

Nearly a mile to the south-westward of Tanjong Batu, on the opposite side of the channel, is a bank with a rock awash at low water.

Tides.—Spring tides rise $7\frac{1}{2}$ feet; neaps $5\frac{1}{2}$ feet.

Chart 2637, Strait of Makassar, southern part.

The coast from Kelumpang bay turns north-east for 10 miles to Tanjong Sabau, then northward for 5 miles to the conspicuous Tanjong Tamiang, continuing in the same direction for 14 miles more to Samalantakang, the western entrance point of Pamukan bay. This part is uninhabited, except for a small village a little westward of Tanjong Tamiang.

Some 6 or 7 miles inland, a range of hills, with rather prominent summits, runs parallel to the coast from Tanjong Batu nearly to Pamukan bay; in very fine weather the inland mountains, of over 6,000 feet, can be seen from sea.

Reefs.—With the exception of Addington reef there are no dangers on this part of the coast outside the 5-fathoms line, within that depth it is very foul.

Gosong Perasa Basah lies 4 miles eastward of Tanjong Saboleh, within the 3-fathoms line.

Perasa Basah reef, of coral and stones, lies $3\frac{1}{2}$ miles, 129° true, from Tanjong Tamiang, and dries at low water; a small part, covered with sand, at the north-west end, is always dry. A rock with 10 feet water, and 4 to 5 fathoms around, lies $2\frac{1}{2}$ miles to the northward of this reef.

Pamukan reef, with a least depth of 2 feet, $5\frac{1}{2}$ miles, 27° true, from Tanjong Tamiang, is also surrounded by depths of 4 and 5 fathoms.

Addington reef (*Lat. $2^\circ 43'$ S., Long. $116^\circ 46'$ E.*), very dangerous to navigation, lies 18 miles, 123° true, from Tanjong Merah, and is 2 cables long and one cable broad. The reef consists of dark coral and stones, with a least depth of 3 feet, and 16 to 19 fathoms around; only in a very calm sea and at a short distance is the position indicated by slight ripples.

At a distance of 20 miles, 107° true, from Addington reef is a coral reef, $5\frac{1}{2}$ cables long and $2\frac{1}{2}$ cables broad, with a least depth of 4 feet over it and 17 to 24 fathoms around. Under favourable conditions this reef may be seen by discoloured water.

Pamukan (Pamukang) bay, the broad estuary of several rivers, is at the entrance 4 miles across, between Tanjongs Samalantakang and Merah, in bearing nearly east and west; the bay runs

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Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

northward for 5 miles, and westward for 8 miles. Around Tanjong Samalantakang is a sandy beach, and just westward of the point a native village, built mostly over the water; other shores of the bay are of mud, low, and overgrown. Tanjong Merah, steep, and covered with tall trees, rises to the height of 200 feet; from southward it appears as an island, and can be seen from a considerable distance.

Through the bay, between extensive mudbanks, there is a channel of from 5 to 2 fathoms, and the latter depth is carried into the Sungis Sampanahang and Menungul. North of Tanjong Samalantakang, on the edge of the northern bank, is a rock which dries at low water; 3 cables west is a wreck, with masts showing.

The bar, formed of mud, sand, and stones, is a prolongation of the shore banks on either side, and projects out 5 miles southward from Tanjong Merah. Of the two channels over the bar, the western, with a depth of 2 fathoms, is between Samalantakang, and a ridge of 3 feet depth extending south-east about 2 miles. The eastern channel with 2½ fathoms is eastward and northward of the bank extending from Tanjong Samalantakang.

DIRECTIONS.—The western channel is approached with Tanjong Samalantakang (*Lat. 2° 34' S., Long. 116° 25' E.*) bearing 354° true, and the point is passed, in 3 fathoms water, about 100 yards distant; this, the narrowest part of the passage, is fully 300 yards wide.

Entering from southward by the eastern or main channel, the east side of Tanjong Merah should be kept bearing westward of 2° true, until the west extreme is 317° true, when a course 303° true will lead to anchorage off Tanjong Samalantakang.

Leaving the bay by this channel, and bound northward, a course 58° true may be steered when Tanjong Sapada bears westward of 2° true.

The coast from Tanjong Sapada, the eastern extreme of Tanjong Merah, for 20 miles northward to Tanjong Aru, is low, muddy, and covered with trees. The northern part of Tanjong Aru consists of sand, with cocoanut trees; on the western side of the point is a fishing village of 10 or 12 houses, with about 40 inhabitants.

Between Tanjongs Sapada and Aru, the 3-fathoms line is at an even distance of 3 miles from shore, with Riu reefs near its edge, about midway between. The southern rock, with 2 feet water over it, is 6 miles from Tanjong Sapada, with two others northward; the northern of these dries at low water.

Aru bank, to the south-eastward of Tanjong Aru, and 4½ miles from shore, consists of two detached reefs of coral and stones, covered with mud and sand, and drying at low water. The southern reef is

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Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

rather more than a mile long, in a north-north-westerly direction, and three-quarters of a mile broad; the north-western part of this is covered with fine white sand, and only covers at high springs. The northern reef, nearly half a mile in length, is separated by a channel, running north-west with 22 feet water. A depth of 3 fathoms is found half a cable from the dry edge of the bank.

LIGHT (*Lat. 2° 15' S., Long. 116° 40' E.*).—From an iron tower on piles, 79 feet high, on the south part of Aru bank, is exhibited a *white group flashing light every ten seconds*, showing *two flashes of four-tenths of a second each*; eclipse between flashes *two and one-tenth seconds*, between groups *seven and one-tenth seconds*. The light is 80 feet above high water, and visible 13 miles.

Two and a half miles north of the lighthouse there is a depth of only 3 fathoms.

Cora reef, almost a continuation of Blenheim, is $1\frac{3}{4}$ miles long; the shallowest part, of 4 fathoms, is 3 miles from the centre of Blenheim reef.

A bank of coral, of 5 fathoms depth, sometimes marked by discoloured water, is $14\frac{1}{2}$ miles, 147° true, from Aru lighthouse.

Blenheim reef, almost 4 miles in length, and half a mile wide, consists of several separate parts with depths of 2 to 8 fathoms, and deep water between. The shoalest part, about the middle, is nearly awash at low water, and lies 16 miles 136° true from Aru lighthouse.

Anna reefs are two coral heads, which dry at low water, with $3\frac{3}{4}$ fathoms between; they extend over $1\frac{3}{4}$ miles, and are three-quarters of a mile across. The northern and largest is nearly 3 miles south-eastward of Cecil reefs.

Cecil reefs extend in a north-east direction for 3 miles, and are fully one mile broad; there are various detached portions with one to 6 fathoms, and soundings between of 12 to 29 fathoms. The largest reef, 15 miles, 117° true, from Aru lighthouse, is circular in shape, half a mile across, and partly awash.

The passage between the easternmost of the above reefs and those on the west side of Balabalagan islands, is 6 miles in width.

September reef is about $2\frac{1}{2}$ miles long, one mile broad, and consists of coral, sand, and stones. About the centre of the bank, a patch 2 cables long, awash at low water, is 9 miles, 102° true, from Aru lighthouse; and there are six other heads with 2 to 6 fathoms over them. Round about the shoal are soundings of 11 to 26 fathoms.

About $3\frac{1}{2}$ miles to the southward of the dry part of September reef is an isolated depth of $6\frac{1}{2}$ fathoms.

Hercules reef, 8 miles, 153° true, from Aru bank lighthouse, is half a mile long in a north-north-easterly direction, and $1\frac{1}{2}$ cables broad; a circular portion about a cable in diameter, dries at low

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Chart 2637, Strait of Makassar, southern part. Var. 2° 10' E.

water. The reef is of coral, with sand and stones, and there are depths of 15 fathoms all round.

Lima or Siri islands are a group of five low wooded islets, covering a space about 5 miles long north and south, and 2 miles wide. For some years they have been permanently inhabited, and also are visited, during the south-east monsoon, by large numbers of fishermen from Spermonde archipelago. The trees are being felled for fuel and other purposes, so that the appearance of the islands from a distance may, within a reasonable time, be considerably altered.

Sibaru (*Lat. 5° 6' S., Long. 117° 3' E.*), the largest and southernmost, is a mile in length and thickly wooded; near the south-west side one tall tree stands conspicuously above the others, and is visible 15 miles. The surrounding reef is one cable wide on the north side, but half a mile in other directions, and is steep-to. On the outer edge of the reef is a raised ridge of stones, making landing difficult; this feature is common to the other islands.

Masalima, the westernmost and highest, is also covered with tall trees. The reef is narrowest on the east side, and the stones along the north edge cover only at high water.

The remaining islands, Pamelika, Salaria, and Pamatawa, are of less elevation, and from these the trees have been mostly removed. Each island is surrounded by reef, the passages between are deep, and the current generally runs strongly through.

Westward of the line of the islands, between Martaban bank, 50 miles north, and Aurora bank, 25 miles south, are numerous places with comparatively shallow water, but many of them are of more than 5 fathoms, and therefore not dangers to small vessels likely to visit this neighbourhood.

Of the shoals which impede navigation are Batu Buntunga or Laurel reef, consisting of eleven detached patches with deep water between, extending northward of Lima islands for nearly 40 miles, and from 3 to 8 miles within the 100-fathoms edge of the bank. The least water is 2 fathoms, 30 miles north of Pamatawa; other places have depths of 3 to 5 fathoms.

Southward of the islands, Trinidad reef, of $2\frac{3}{4}$ fathoms, is 2 miles, 204° true, from Sibaru island. Aurora bank, with a depth of $4\frac{1}{2}$ fathoms, is the southernmost danger known to exist.

Lari Larian (*Lat. 3° 31' S., Long. 117° 28' E.*) is an island 2 cables long, overgrown with cocoanut trees and shrubs, and there is a house on it. The surrounding reef is a mile long, and narrowest on the south-west side. There is anchorage on the north-west side, in 7 or 8 fathoms.

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Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

A coral reef, about 3 cables across, with $3\frac{1}{2}$ fathoms water over it, lies 10 miles, 230° true, from Lari Larian, and is not easily seen. Five miles east of this reef there is a depth of 5 fathoms.

Taka Tallu, 12 miles, 131° true, from Lumu Lumu, is a small barren bank, about 3 feet high, surrounded by a coral reef, and difficult to see at high water; 11 miles, 30° true, and 8 miles, 67° true, from Taka Tallu, are two sand and coral patches of $6\frac{1}{2}$ and 7 fathoms water, respectively.

Lumu Lumu (meaning seaweed) (*Lat. 2° 56' S., Long. 117° 33' E.*) is a sandbank 170 yards long by 30 yards wide; the surrounding reef, which dries in great part at low water, extends a mile west and north, and nearly 2 miles to the south-westward, but is less broad on the east side.

In the months of April, May, June, parties from the mainland visit the bank, to collect an edible seaweed found upon the reef. Water of doubtful quality is obtained by digging wells or pits.

Directions.—As there are no marks available for clearing the dangers upon the southern portion of Borneo bank, it would be advisable for vessels bound west to pass between the islands of Lima group. The passage northward of Sibaru is the widest and most convenient, being more than a mile broad between the reefs, with a depth of about 30 fathoms. Steering through, mid-channel, the edge of Sibaru reef is cleared when the south-eastern sides of Masalima, Salaria, and Pamatawa are in line, 47° true, and the north side of Pamelika in line with the south point of Masalima, 74° true, will lead in deep water between the two 6-fathom heads 10 miles westward of the islands. The current may run through this passage $2\frac{1}{2}$ miles an hour; in the eastern monsoon the direction is north-westerly, and in the western monsoon to the south-eastward.

BALABALAGAN or LITTLE PATERNOSTER ISLANDS, between lats. 2° 0' S. and 2° 44' S., and longs. 117° 0' E. and 118° 6' E., are several groups of islets and reefs, on the northern edge of the great Borneo bank, covering a space 75 miles in length; being at the west end 30 miles in breadth, tapering eastward to a point at Samarang shoal. The islands are not permanently inhabited, but are much frequented by migratory fishermen from Borneo and Celebes. Large quantities of dried fish are exported, also birds' and turtles' eggs, sharks' skins, shells, and tripang (sea-slugs).

The general formation of these islands is a foundation of coral and a stratum of sand thrown up from the sea, followed by driftwood and vegetable débris, aided by deposits of innumerable sea birds. Grass, creeping plants, and brushwood gradually appear, and finally, on the

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

larger islands, are trees, some already 180 feet in height, visible from a vessel's deck a distance of 16 miles.

Along the north-east edge of the bank is a chain of reefs, drying in many places, which rise very steeply from depths where no bottom is found at 100 fathoms. On these reefs are the islands Sebangkatan (North Teleensing), Seturian (Tempilagaän), Kabala Duwa (Lamudong), and Balabalagan.

This feature, a raised ridge of little width, with deep water within, will be found, more or less, along the whole edge of the bank southward for over 200 miles.

Within the northern group, at a distance of 8 or 10 miles, are the islands of Teleensingan, Saboyan, Kamarian besar, Kamarian kechil, Samataha, Semanga besar, Semanga kechil, Poöng - Poöng, Lamudaän, Melambir, Pinaät, and Semangil, forming an irregular line parallel to the outer ridge. Northward of these islets depths of 16 to 30 fathoms are found, with coral bottom, sand and shells being only exceptionally met with; southward, however, sand and shells prevail, and growing coral is occasionally seen. On the western side of these inner islands are a double row of reefs extending north and south, which partly dry; about the middle of the eastern reef is the islet Sangai.

Ambungi reef, the northernmost danger, is about 4 cables long, and half this in breadth, a small portion being always dry; one mile east there is no bottom at 100 fathoms. North-westward for about 15 miles, the bottom is very irregular, with some sunken rocks and depths from 66 to 7 fathoms, and possibly less; a small head of 3 fathoms lies a mile north-north-west of the reef.

Sebangkatan (*Lat. 2° 13' S., Long. 117° 24' E.*), the most northerly island, is $3\frac{1}{2}$ cables long and $1\frac{1}{2}$ cables broad, thickly wooded, with a tree 173 feet high on the south-east point. On the east side the island is steep-to, but southward the reef stretches off nearly 4 cables. Reefs, which partly dry, extend north-westward for 3 miles, and south-eastward there is rough ground. The edge of the bank from Sebangkatan, trends south-eastward for 6 miles, then turns sharply north-east for a like distance before resuming the general south-easterly direction towards Seturian.

Seturian island, about 16 miles south-eastward of Sebangkatan, is $2\frac{1}{2}$ cables long, thickly wooded, and may be seen 16 miles off.

About 11 miles to the south-eastward of Seturian is a dry sandbank, covered with grass. Between this and Seturian are six reefs which partly dry, with narrow gulleys of deep water between. A further portion of the raised ridge extends 5 miles south-east of the sandbank.

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

Kabala Duwa, partly covered with grass and brushwood, is about 3 cables long, narrow, and cannot be seen beyond 6 miles. The island is on the western part of a reef 4 miles long, which dries in many parts, with two small sandbanks, on the east end, always above water.

Balabalagan island, the most easterly of the group, is nearly 3 cables long, covered with tall trees, and may be seen at a distance of 16 miles. The passage between this island and Kabala Duwa is nearly barred by a ridge with only 2 fathoms water.

Jaitan shoal, the easternmost of the reefs which dry, is uncovered at half tide, and is on a ledge of foul ground which projects 4 miles to the south-eastward of Balabalagan.

Samarang shoal (*Lat. 2° 43' S., Long. 118° 7' E.*), the south-eastern extreme of the ridge on which lie the Balabalagan islands, is one mile long and 3 cables broad, and has a least depth of 3½ fathoms. A narrow ridge extends to the north-westward with depth of 5 to 7 fathoms.

Along the eastern edge of the bank, south-eastward of Samarang shoal, there are depths of 7 to 21 fathoms. Union bank, of 8 fathoms, also a portion of the submerged ridge, is 10 miles further south-east.

Southward of Union bank the ridge is in some places broken through by deep gulleys, or is entirely absent. When the current runs with any strength, the edge is marked by ripples or overfalls; these are most frequent in the west monsoon.

The water about here is generally very clear, and the bottom has been seen in 17 fathoms, so that depths up to 10 fathoms may appear as dangers.

Of the islands forming the inner group, Teleensingan, the western, is 3 cables long. Two miles north of the island is a coral reef, a small part always dry.

Saboyan, 3 cables long, has a clump of trees on the north point reaching a height of 180 feet above the sea, making this the highest island on the bank.

Kamarian besar and Kamarian kechil, two small islands, a mile apart, on a bank 3 miles westward of Saboyan; the southern island is a cable long and covered with high trees, the northern is a sandbank, with creeping plants and one small tree 13 feet high.

Samataha, 5 miles southward of Saboyan, is 3 cables long and wooded.

Pööng Pööng is 3 cables in extent, with trees 100 feet high. Pööng Pööng and Samataha islands are respectively on the east and west sides of a large reef 3 miles across.

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

Semanga besar and Semanga kechil are north-eastward of Poöng Poöng; the first has a tall tree near the east point, the second is low, with one small tree 13 feet in height.

Lamudaän, nearly 3 cables long, is at the north-east end of a reef 5 miles long; it is covered with tall dark trees, visible about 16 miles. Half a mile eastward there is a small wooded islet.

Melambir, 3 miles eastward of Lamudaän, and $2\frac{1}{2}$ cables long, is thickly wooded with one tall tree in the centre which may be seen 16 miles. On the south end of the reef there is a sandbank, always visible.

Pinaät, north-east of Melambir and on the north end of a reef more than a mile long, is a quarter of a mile in length, and covered with tall trees, two of these standing out above the others. North-eastward of Pinaät are detached reefs over a space of 3 miles, with a small sandbank always seen.

Semángil, the south-eastern of the inner group of islands, is nearly half a mile long and wooded, but the trees are not so tall as on the other islands. The reef southward from the island, is very steep on the western side.

Six miles, 114° true, from Semangil, is a coral reef 4 cables long, nearly awash and steep-to.

Byron reef, circular and 4 cables across, is 9 miles 258° true from the island of Balabalagan; a small sandbank is always dry, and the reef is very steep all round.

Four miles west of Balabalagan there is a detached reef, about the size of Byron reef, with a least depth of 3 feet.

Sangai (*Lat. $2^\circ 14'$ S., Long. $117^\circ 8'$ E.*).—Westward of the larger Balabalagan islands there is an area 30 miles north and south, and 15 miles east and west, full of banks and reefs; most of these dry, more or less, at low water, and in a few places small parts never cover. Sangai is partly covered with brushwood, and has one small tree 17 feet high, which is visible from about 8 miles distant.

The most northerly reef that dries is in lat. $2^\circ 10'$ S., long. $117^\circ 2'$ E.

Unarang reef is the southernmost of these dangers, and is nearly always dry. Nearly 8 miles east of Unarang is a large reef, which dries in some parts at low water.

In the space some 10 miles southward of Unarang reef, breakers have been reported.

Currents and tidal streams, in the vicinity of Balabalagan islands, are very variable, running through deep channels between the reefs, with considerable velocity, but on the open bank within, are most irregular, and depend greatly on the direction and force of the wind.

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

Anchorage is found generally upon the bank, with coral and sand bottom; the water usually deepens on approaching the reefs, which, as a rule, are steep-to.

Directions.—No detailed description of the above islands and reefs would be sufficient for navigation, and no ship should venture amongst them without a reliable chart; even then the greatest vigilance is necessary, to recognise dangers known, and in observing others which may not have been discovered.

Vessels proceeding through the islands from south-westward should steer for the high trees of Samataha, bearing 47° true, passing 2 miles westward of Samataha and close east of Saboyan, thence out by the 6-mile broad passage south-east of Sebangkatan.

Entering from northward by the latter channel, the foul point of the bank to the eastward, will be avoided by keeping the wooded island of Lamudaän bearing 187° true. There is also a safe passage, one mile wide, with 20 fathoms water, north-westward of Seturian island.

From eastward, the 3-mile wide channel west of Kabala Duwa may be used. At the entrance of the channel, the tops of the higher trees on Semangil island are seen.

The larger part of Borneo bank, south of Samarang shoal, contains few islands, but many coral heads spring abruptly from the bottom, generally of small extent, and with a greater depth than 5 fathoms over them. Except over a distance of 60 miles towards the south end of the bank, covering the Lima islands, there are large areas of unimpeded waters, where vessels may cross between Borneo and Celebes. Westward of the meridian of 117° 6' E. the Borneo coast can be sighted and a position generally obtained; but it is only eastward of 117° 50' E., and in the westerly monsoon, that the more prominent features on the Celebes side are seen. The least distance between the east edge of the bank, in lat. 3° 5' S., and the Celebes shore, at Tanjong Onkona, is 22 miles.

The Borneo coast, from Tanjong Aru (Lat. 2° 10' S., Long. 116° 35' E.), turns north-westward for 10 miles, to Tanjong Giling, and is very low. Several rivers here run into the sea, and the 3-fathoms line is 5 to 7 miles from shore, rising steeply within, and drying in many parts at low water.

Telok Apar, the mouth of the largest stream, is immediately south of Tanjong Giling; in the outer part, when over the shallow bar, 6 fathoms are found, but it speedily narrows, and becomes only navigable by boats. In the rainy season so much water is discharged that an outset of more than 2 miles an hour may be observed in depths of 5 to 10 fathoms.

Sungi Pasir, 6 miles north of Tanjong Giling, is 4 cables across

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

at the mouth between Tanjong Teriti on the south, and Tanjong Tai on the north; on Tanjong Teriti is a grove of trees visible far out to sea. The residence of the Sultan of Pasir is on the bank of the river, 20 miles from the entrance.

Three drying banks of hard mud lie before the mouth of the river, and from the south point a hard stony ridge projects 6 miles south-eastward.

Buoys.—The approach to Sungi Pasir is from north-east, and the channel over the bar is marked by an outer black conical buoy surmounted by staff and ball, with Tanjong Mandu bearing 280° true, distant 5 miles, and an inner black can buoy, in 11 feet water, Tanjong Mandu bearing 313° true, and Tanjong Tai 233° true.

Reefs.—Anjir Sabon reef, consisting of hard ground and stones, extends from Tanjong Sabon to the eastward for nearly 3 miles, and has a depth of 2 fathoms on the outer edge.

Palambu reef, a circular coral reef of fully 2 cables diameter, partly dries at low water, and lies $4\frac{3}{10}$ miles, 84° true, from Tanjong Sabon.

Karangan reef, 2 miles further eastward, is nearly 3 cables in diameter, and also partly dries at low water.

Batu Meha is a round rock which dries at low water.

Communication.—A vessel of the Royal Dutch Packet Company calls at the Sungi Pasir every three weeks.

Directions.—From the outer buoy to the black can buoy, the course is 240° true, when the mouth of the river will be seen open. From the latter buoy the course is 232° true until Tanjong Mandu bears 353° true, then 249° true to clear the stony ridge on the south side; and when Tanjong Mandu is in line with Tanjong Tanah bearing 12° true, the river entrance may be steered for.

The least depth is 4 feet, which increases to $2\frac{1}{2}$ fathoms abreast Tanjong Tai, and to $4\frac{1}{2}$ fathoms off the village Muara Bajoa, 5 miles above. The bottom is soft mud.

Proceeding outwards and bound south, when Tanjong Mandu is 358° true, a course may be steered 92° true for 10 miles, into 10 fathoms water, in order to ensure being well clear of all dangers.

Tides.—The range at springs is 8 feet, and at neaps 3 feet.

Adang bay, between Tanjong Mandu and Tanjong Maruat (*Lat. 1° 36' S., Long. 116° 34' E.*), 12 miles to the north-eastward, is a broad estuary about 15 miles deep, which receives the waters of the considerable Sungis Raja, Pasirlama, Lombok, Adang, and Telakai. Of these, the most important is Pasirlama, which may be ascended by vessels of 18 feet draught, to the large village of Pasirmajang on the left bank; the passage in is along the south shore of the bay.

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

The Sungai Lombok can be entered by vessels drawing 18 feet, and the Sungai Adang by vessels of 12 feet draught; local knowledge or the assistance of a pilot is, however, necessary when navigating these rivers.

The other streams are blocked by a mudbank 2 miles broad, which lines the whole north shore.

The coast is low, and the bay is open to easterly winds and swell, but in the Sungis Raja, Pasirlama, and Lombok vessels can lie sheltered from all winds and weather.

Coast.—From Tanjong Maruat, the north point of Adang bay, the low muddy coast bends north-westward for 5 miles, then curves to the north-eastward for 17 miles, to Tanjong Balik Papan.

Plan of Balik Papan bay on 3031.

The 3-fathoms line, about 2 miles from the beach, may be safely approached until Tanjong Balik Papan bears 2° true; eastward of this bearing isolated coral reefs, which partly dry, project 3½ miles, 173° true, from the point, with no passage between them and the land.

BALIK PAPAN BAY is a safe haven at all seasons, with anchorage in 6 to 12 fathoms, over an area upwards of 4 miles long, and one mile wide. In clear weather Balik Papan peak, 4,439 feet high, can be seen at a great distance, and is a conspicuous mark for making the bay.

On the eastern side of the harbour, half a mile north-eastward of Tanjong Tokong, is a station of the Netherlands Indies Industries and Trading Company, including offices of the Harbour master and pilot service. This company is engaged in sinking petroleum wells. A landing pier projects 390 feet, to the edge of deep water, with a mooring buoy, westward of the pier, to which large vessels may secure.

Three cables, 327° true, from the pier, is a reef of coral and stones 1½ cables long, with a least depth over of 3 feet. A red and white beacon, with ball, is on the centre of the reef, and the north and south ends are marked by red light-buoys, in about 4 fathoms water. Ships moored to the pier, head northward, and hindered by other vessels from turning outward, can safely pass east and northward of this shoal.

The entrance is between Tanjongs Balik Papan (Jumalai), and Tokong (*Lat. 1° 16' S., Long. 116° 48' E.*), bearing 27° true, distant 6 miles; the western shore is low, but Tokong is steep with a small conical hill of 413 feet, immediately within the extreme, and the precipitous islet Tokong half a cable from the point. The passage in is, between a bank of less than 3 fathoms water projecting 9 miles eastward from Tan-

General charts 2637, 2636, 941b, 1263, 2759a.

Plan of Balik Papan bay on 3031. Var. 2° 20' E.

jong Balik Papan, and a mud-flat, also of under 3 fathoms, extending $2\frac{1}{2}$ miles south from the land eastward of Tanjong Tokong.

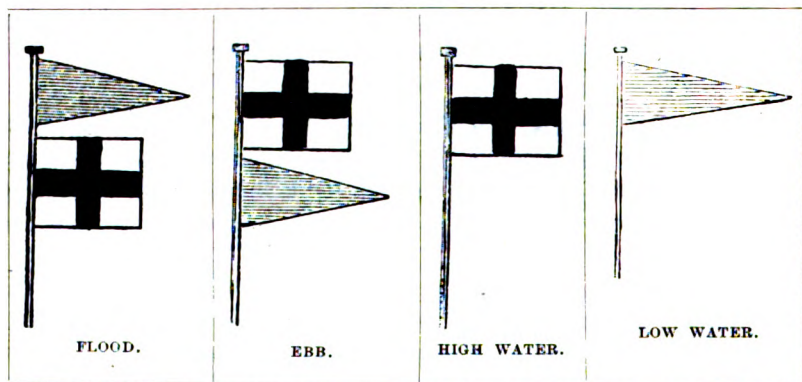
The least water in the channel is 4 fathoms, between the two outer buoys, increasing in depth gradually to 13 and 15 fathoms on nearing Tanjong Tokong.

Pilot-vessel and light.—The pilot-and-light-vessel, coloured black with “Balik Papan” in white letters on sides, and with three masts, is moored in 7 fathoms, 106° true, nearly $9\frac{3}{4}$ miles from the conical hill on Tanjong Tokong (*Lat. $1^\circ 19' S.$, Long. $116^\circ 57' E.$*).

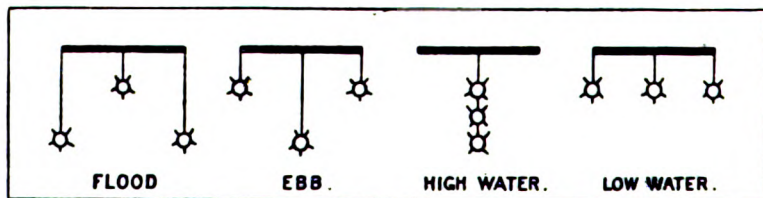
From the vessel is exhibited, at the height of 74 feet, a *fixed white light*, visible in clear weather 14 miles. Pilotage is compulsory.

Tide signals are shown at the pilot-vessel, in daytime with a blue pendant and a white flag with black cross, by night with *white lantern lights*.

DAY SIGNALS.



NIGHT SIGNALS,



Buoys.—The fairway is marked on the starboard side (entering) by a white light-buoy, showing a *white occulting light every twenty seconds*, two red light-buoys exhibiting *fixed red lights*, and a *white conical buoy*. The white light-buoy is moored southward of Tanjong Tokong; the red light-buoys mark the extremities of the reef north-westward of the pier, as previously mentioned; the white conical

General charts 2637, 2636, 941b, 1263, 2759a.

Plan of Balik Papan bay on 3031. Var. 2° 20' E.

buoy is moored at a distance of $1\frac{4}{10}$ miles, 20° true, from the north point of Tanjong Tokong.

On the port hand (entering) are :—a black light-buoy, No. 2, exhibiting a *white occulting light every twenty seconds*, $1\frac{1}{2}$ miles within the end of the spit extending from Tanjong Balik Papan; a black can buoy, No. 3, 3 miles further up; and two black can buoys opposite Tanjong Tokong, marking the telegraph cable. There are also a black mooring buoy off the factory pier, and a black can buoy $1\frac{1}{4}$ miles northward of Tanjong Tokong.

Prohibited anchorage.—For the protection of telegraph cables, anchorage is prohibited between a line extending 202° true from the south point of Tokong island (*Lat. 1° 16' S., Long. 116° 47' E.*) to the western bank, and another line extending 270° true from the cable-house also to the western bank; the western ends of these lines are marked by the above black can buoys.

Tides.—Spring tides rise about 9 feet, neaps 5 feet.

Directions.—Bring the pilot vessel to bear 84° true, distant 2 miles; then pass half a mile northward of Nos. 2 and 3 buoys, 2 cables westward of No. 4 buoy, and turn northward into the harbour. Vessels not exceeding 12 feet draught, may cross the outer bank, in 14 feet water, with Tanjong Sepaku in line with Tanjong Tokong, bearing 341° true; approaching this leading mark from westward, the water should not be shoaled to less than 10 fathoms, to clear the reefs southward of Tanjong Balik Papan.

Communication.—Vessels of the Royal Dutch Packet Company call at Balik Papan every fortnight, on the Singapore, Banjer-masin, East Borneo, route; also every fortnight from Singapore, Java, to Tomini gulf.

Telegraph.—Balik Papan is in telegraphic communication with Banjermasin; cables are laid to Kwandang (Celebes) and Makassar.

Trade.—Balik Papan is growing fast in importance, and now ranks fourth port in Netherlands India. In 1908 the exports were valued at £373,473 (of which various kinds of oil accounted for £372,865), and the imports at £323,167. About 2,000 rubber trees, chiefly Pará, were planted in 1908.

Shipping.—In the same year 1,319 steam vessels, with an aggregate tonnage of 623,399 tons, and one sailing vessel of 447 tons, entered and cleared from the port.

Chart 2636, Strait of Makassar, northern part.

The coast from Tanjong Tokong runs in an easterly direction for 6 miles, then gradually curves to the north-eastward, maintaining that direction to Muara Jawa, the southern mouth of Sungai Mahakan; the land is generally higher than that more southward, with coast hills capped by tall trees, and a sandy beach.

General charts 2636, 2637, 941b, 1263, 2759a.

Chart 2636, Strait of Makassar, northern part. Var. 2° 30' E.

Tanjong Tanah Merah, 10 miles from Tanjong Tokong, is named from a steep little hill of red sand near the point. At Senipa, 6 miles south of Muara Jawa, the sandy beach terminates, and the shore becomes low and marshy; a mile southward of Senipa there are a few scattered houses. Tanjong Timbangongot (*Lat. 0° 55' S., Long. 117° 15' E.*), the south point of the river mouth, is low, but may be recognised by a group of tall trees 7 cables within the extreme.

Between Balik Papan and Muara Jawa, the 5-fathoms line is parallel to and about 3 miles from shore; the depth decreases gradually, and the bottom is generally mud.

DIRECTIONS from Pulo Laut to Sungi Mahakan.

—Between Pulo Laut and Hercules reef the projecting shore banks should not be approached within the depth of 7 fathoms; when nearing Hercules reef do not go off-shore into more than 10 fathoms, until the lighthouse, or light on Aru bank is seen. When past Aru bank, steer direct for Muara Jawa.

Plan of Sungi Mahakan on 2662.

SUNGI MAHAKAN (Kutei), the most important river on the east coast of Borneo, is navigable by ocean-going ships to Tenggarung, the capital of the province of Kutei, a distance of 60 miles from sea. From the point where the river reaches the general line of the coast running north and south, its waters divide into four main channels, subdivided again into many smaller passages, which form a wide-spread, fan-shaped, delta, projecting eastward for 20 miles, and extending north and south for 40 miles. Beyond the edges of the dry lands, there is a fringing bank from 3 to 5 miles wide, which dries in many places, dips quickly into 3 fathoms, and a short distance outside into 10 fathoms, the 100-fathoms line being 15 miles from the edge of the bank. The detached portions of the delta are known as the Pamarung islands.

The four large and navigable outlets are Muara Jawa, the southern; Muara Bekapai, which joins Muara Bayor, the eastern or main entrance; and Muara Berau, the northern. With the exception of the latter these are all buoyed, and have an established service of pilots.

The outer shores of the Pamarung islands are low, swampy, generally covered with stunted wood, and broken by the many mouths of minor streams. Upon Tanjong Pamarung, 10 miles eastward of Muara Jawa, are some tall trees, with a wide opening on the north side. Tanjong Bayor (*Lat. 0° 43' S., Long. 117° 36' E.*), on the south side of Muara Bayor channel, is well defined; 7 miles westward, near the village of Buntal, on the south side of the passage, is a grove of high trees, seen far out to sea, and appearing from there as a detached islet. There is also a conspicuous wood on Tanjong Pelai, 12 miles north of Tanjong Bayor; and a similar group of trees three-quarters

General charts 2636, 941b, 2660b, 1263, 2759a.

Plan of Sungi Mahakan on 2662. Var. 2° 30' E.

of a mile south-east of Tanjong Lerung, on the east side of Muara Berau. The waters of the river are always turbid, and in the rainy season trees and large patches of vegetation are carried out to sea, and may appear as islands or praus under sail.

Vessels passing along these islands should not come within the depth of 10 fathoms.

Muara Jawa, the southern mouth of Sungi Mahakan, is, for ships from southward, about 40 miles less in distance than by entering through Muara Bayor, but has only 6 feet at low water. From the outer bar to its junction with the main stream this channel is 25 miles in length.

The Sungi Dundung, 6 miles northward of Tanjong Timbangongot, is navigable for a distance of 6 miles, by vessels of 12 feet draught.

A shoal, with $1\frac{3}{4}$ fathoms water, lies 8 cables northward of Mount Ulu, and the western shore must here be kept close aboard. Opposite Tanjong Dewa, in the northern entrance of the Muara Jawa, at its junction with Muara Bayor, is a large sandbank, and immediately westward of the northern part of this bank is a shoal of about 35 yards diameter, with one fathom of water over it, and depths of 2 fathoms around.

The least depth at low water is 6 feet, at the entrance of Sungi Dundung, $5\frac{1}{2}$ miles north of Tanjong Timbangongot, while on the outer bar 7 feet will be found.

The pilot-vessel (Lat. $1^{\circ} 0' S.$, Long. $117^{\circ} 12' E.$), in 7 fathoms water, 7 miles, 210° true, from Tanjong Timbangongot, has two masts, and is painted black, with "*Moeara Djawa*" in white letters, on sides. It exhibits a *white fixed* light, at an elevation of 39 feet above the water, and visible from a distance of 9 miles.

Tide signals, similar to those at Balik Papan, are shown by day and night. (See page 364.)

Pilotage is compulsory. Should the pilot be unable to board from any cause, flag D of the International code is shown by day, and a *red* light by night.

Buoys and beacons.—The channel is marked on the starboard side (entering from southward) by one white light-buoy and four white conical buoys; on the port side by one black can buoy. The white light-buoy lies at the entrance, and exhibits a *white occulting* light *every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*. A beacon, surmounted by a white triangle, stands in 4 feet water, one mile southward of Tanjong Timbangongot. Of the four white conical buoys, one lies in the outer channel, one by the Sungi Dundung, and the other two mark the shoals off Tanjong Dewa. The black can buoy lies by the Sungi Dundung.

As the positions of these buoys are frequently altered, no stranger

General charts 2636, 941b, 2660b, 1263, 2759a.

Plan of Sungai Mahakan on 2662. Var. 2° 30' E.

must enter without a pilot, and the latest information should always be obtained from the pilot-vessel. In the absence of the pilot-vessel, a position may be found by the tall trees on Tanjong Timbangongot, and the extreme of Tanjong Pega, which will be the most easterly land in sight.

Tides.—In the Muara Jawa springs rise about 9 feet, neaps 4 to 5 feet.

Buoys.—The edge of the bank between Muara Jawa and Muara Bekapai, is marked by two conical buoys, surmounted by staff and ball, moored in 10 fathoms water; the western buoy has black and white horizontal stripes, the eastern black and white vertical stripes.

Muara Bekapai.—The Muara Bayor can be entered by means of the Muara Bekapai and its tributary, the Sungai Bagusan; the passage through the latter, owing to the greater depths, is preferable.

The least depth over the outer bar of the Muara Bekapai, almost midway between the two light-buoys, is 12 feet. By the north-east point of Pemarung island is a hard inner bar of 9 feet least water, and abreast Tanjong Kee, the north point of Borukan island, is a bank with only 8 feet of water over it. The two latter bars are avoided by following the Sungai Bagusan. The southern part of this latter river is broad and straight, and, with the exception of a soft mudbank of 5 feet water extending from the eastern bank, near its northern end, has deep water throughout; the northern part is narrow and winding, but has a least depth of 12 feet in it.

Light-buoys.—Outside the bar of the Muara Bekapai is a light-buoy with red and black horizontal stripes; further in, on the western side of the channel, is a black light-buoy. Both light-buoys exhibit an *occulting white light every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*.

Buoy.—In the sharp bend of the Bagusan river, southward of the northern junction of the Muara Bekapai, is a white conical buoy, marking the edge of the bank referred to above on the starboard hand.

Directions.—Approaching the Muara Bekapai, the outer light-buoy with red and black horizontal stripes, Tanjong Pemarung (*Lat. 0° 53' S., Long. 117° 27' E.*) (with high trees on it), and the south-eastern point of Borukan, will be recognised; course may then be steered to pass the inner light-buoy on the port hand. When abreast Tanjong Pemarung keep to the port hand bank, rounding the next point closely to enter the Sungai Bagusan and continuing about 165 yards from the port hand bank until in the broad straight part of this river, when a mid-channel course may be steered.

If proceeding by the Muara Bekapai, course must be steered by sight for Tanjong Bekapai when abreast the north-east point of Pemarung. When abreast Tanjong Bekapai, keep to the starboard

General charts 2636, 941b, 2660b, 1263, 2759a.

Plan of Sungai Mahakan on 2662. Var. 2° 30' E.

hand bank; after rounding the bend northward hold over to the port hand bank, continuing along this till in the **Muara Bayor**.

Muara Bayor, the principal channel into Sungai Mahakan, is north of the island of Bayor, and about 30 miles in length, the middle portion being narrow, tortuous, and in one place only 65 yards wide.

The least depth in the channel will allow vessels of 11 feet draught to enter at all times; others, up to 17 feet, must wait for high water.

The pilot-and-light-vessel is in $3\frac{1}{2}$ fathoms, 74° true, from Tanjong Kaju Mojara, distant nearly 10 miles. The vessel, on the edge of the bank on the north side of the channel, has three masts, and is painted black, with "*Moeara Bajor*" in white letters on sides. Similar tide-signals to those at Muara Jawa and Balik Papan, are shown day and night (page 364). Pilotage is compulsory.

From the vessel is exhibited, 75 feet above the sea, a *fixed white* light, visible 14 miles.

Buoys.—The channel is marked on the starboard side (from seaward, by two white light-buoys and a red conical buoy; on the port side by five black can buoys and a conical buoy with red and black horizontal stripes. The light-buoys exhibit a *white occulting* light *every twenty seconds*, thus:—light, *ten seconds*; eclipse, *ten seconds*. The first lies $2\frac{2}{10}$ miles, 77° true, from Tanjong Kaju Mojara; the second northward of the west end of Pulo Niobe (Nubi).

Directions.—The course in from the pilot-vessel to the first white light-buoy is 249° true, then close along the north side of Pulo Niobe, between the second light-buoy and the black can buoy on the south side, and northward of the second black buoy, from here keeping on the north side of the channel to Trusan Klambu, leaving the third black buoy on the port side. Should the pilot-vessel and first light-buoy not be in position, the northern end of Pulo Niobe in line with Tanjong Kaju Mojara, bearing 251° true, will lead through the channel, and when Tanjong Bayor bears 182° true, a course 244° true will gradually open the entrance and bring the village of Buntal in line with the north side of Pulo Niobe (*Lat. $0^\circ 42' S.$, Long. $117^\circ 31' E.$*); this mark being then held up to the island.

In the narrow winding part of the river there are no dangers, and vessels can steer close along the banks. Approaching the junction of the Muara Bekapai vessels must keep close to the starboard hand bank to avoid a bank extending from the western point of Bayor island.

Two miles above the point where the narrow channel joins the broader Muara Bekapai, is the small island of Tungku Kaju, covered with high trees; the passage is northward of this island and of a bank

General charts 2636, 941b, 2660b, 1263, 2759a.

Plan of Sungai Mahakan on 2662. Var. 2° 30' E.

which projects north-westward nearly to the mouth of Trusan Klambu. Vessels drawing 12 feet or more should follow the bend of the mouth of this latter river.

In the middle of the river, northward of the mouth of the Sanga Sanga, are shoals of 8 and 9 feet least water, marked by a red conical buoy; one steers close along the southern bank here.

Muara Berau, the northern mouth of Sungai Mahakan, is not buoyed, and, partly owing to the dangerous reefs northward of the entrance, is not recommended. About $12\frac{1}{2}$ miles up the river is the entrance to the Trusan, which flows along the northern side of Terentang island, and unites again with the Muara Berau northward of Meong island. The depths in this side stream are 14 to 42 feet, but it is very narrow, and should only be used by vessels of short length, as there are two sharp bends at the western entrances. Southward of Terentang is a leper settlement. Approaching from northward, the saving in distance is 25 miles over the Muara Bayor route, and it can be used by vessels with a maximum draught of 12 feet. There is no pilot service.

Reefs.—Northward of the Muara Berau lie several reefs, seldom marked by discoloured water, and of considerable danger to shipping.

The western reef, which dries at low water, and has depths of 11 fathoms around, lies $8\frac{3}{10}$ miles, 349° true, from Tanjong Lerung (*Lat. $0^\circ 22'$ S., Long. $117^\circ 31'$ E.*); it is about 550 yards long and 330 yards broad.

The middle reef, with 2 fathoms water over it, is about one cable in diameter, and lies $8\frac{1}{2}$ miles, 359° true, from Tanjong Lerung; it is marked by a screw pile beacon with white ball.

The eastern reefs, one of which dries and the others have from one to 10 feet water, extend, from about 2 miles eastward of the beacon, 3 miles eastward and $2\frac{1}{2}$ miles northward.

Directions.—Approaching the Muara Berau, the clump of trees on Tanjong Lerung is steered for on course 199° true, till the depth decreases to 6 fathoms; the west side of Badak island will then bear about 240° true, and course is altered to 258° true. After about 2 miles on this course the river opens, and may be steered for on the bearing 203° true. A wood, on the main westward of the northern part of Badak, is a good mark.

When the river has been entered keep to the western bank until fully 2 miles beyond the south-west point of Lerung island, then cross over to the eastern bank, with course 176° true, just above a point with high trees on it. When off the mouth of the Sungai Pajang it is advisable to cross to the western side once more to avoid the extensive bank at the junction of the Muara Kaëli, and further on the bank at the entrance to the Muara Pantuan. Almost midway along Teren-

General charts 2636, 941b, 2660b, 1263, 2759a.

Plan of Sungi Mahakan on 2662. Var. 2° 30' E.

tang island are an islet and bank, which must be left on the star-board hand; Meong island may be passed on either side, in the northern passage a bank of 3 feet least water extends 130 yards from the Trusan, and a bank with depths of 3 to 10 feet extends for 330 yards from the west point of the island.

Nearing Kambing island (*Lat. 0° 35' S., Long. 117° 19' E.*) hold over to the southern side of the river, as an isolated bank of 8 feet least water lies 330 yards to the south-eastward of the east point of that island. When this point bears 25° true cross over to the northern side to clear a bank of 10 feet water opposite the west point of Kambing.

Sungi Mahakan, at Tanjong Dewa, the junction of the two main outlets to sea, is 6 cables across, and maintains this breadth for 10 miles, nearly to the town of Samarinda; from there the stream narrows, and with considerable winding turns south-westward for a further 10 miles, then in a generally north-west direction for 11 miles to Tenggarung.

Sungi Sanga Sanga, which empties through the right bank of Sungi Mahakan, about one mile above Tanjong Dewa, can be ascended for 6 miles, by ships of 15 feet draught, to the petroleum loading wharves of the Netherlands Trading Company. From the northern point of entrance of this river a bank, which partly dries, extends for a distance of one mile to the south-eastward, and is marked by a black can buoy on the eastern side, and a conical buoy, with red and black horizontal stripes, on the south-eastern side.

Balei Lumba, 4 miles above Tanjong Dewa, is a small timbered islet, 130 yards from the south shore; on the opposite shore are the main buildings of the Netherlands Trading Company, and at a distance of 440 yards, 132° true, from the flagstaff, is a rock with 10 feet water, marked by a red conical buoy. Vessels passing northward of the buoy must give it a berth of 35 yards. A mile above is the islet Buaja.

Prohibited anchorage.—Half a mile below Balei Lumba, anchorage is prohibited in a space marked by four white boards, two on the northern and two on the southern shore, where the telephone cable of the Netherlands Trading Company crosses the river.

Samarinda, the principal place of trade of the east coast of Borneo and the head-quarters of the Assistant Resident for Kutei, extends for a distance of nearly 2 miles on either side of the river; on the north shore are the offices of the Netherlands administration, and dwelling of the Assistant Resident. The south shore is entirely occupied by native houses, partly built over the water, and on floating rafts upon the river; also a residence of the Sultan of Kutei. There are besides, here, the head-quarters of the Exportation Company, and Kutei Company, engaged in the collection and export of minerals and petroleum.

General charts 2636, 941b, 2660b, 1263, 2759a.

Plan of Sungai Mahakan on 2662. Var. 2° 30' E.

On the river side are various piers, to which mail packets and other vessels secure.

Population.—In 1905 the population of Samarinda was 4,733, including 109 Europeans and 1,162 Chinese.

Supplies.—Provisions of good quality can be purchased in the town.

Trade.—The principal exports are copra, gutta-percha, rattan, tobacco, and much general local produce. Of imports, the most important are cotton goods, earthenware, gambier, ironware, petroleum, and rice.

Communication.—Vessels of the Royal Dutch Packet Company call at Samarinda every week on the Singapore, Surabaya, Banjarmasin, East Borneo route.

Telegraph.—Samarinda is in telegraphic communication with Balikpapan and Banjarmasin.

Tides.—At Samarinda it is high water simultaneously with Muara Bayor, and low water about one hour later; spring range is 5 to 7 feet, being highest from February to May and lowest from July to October, but it depends to a great extent on the volume of water discharged from the river. From July to October the flood stream is frequently apparent at Samarinda, making it advisable for vessels to anchor sufficiently far from the shore to allow for swinging; in other months the down current is constant.

Tenggarung (*Lat. 0° 25' S., Long. 116° 59' E.*).—Abreast Samarinda the breadth of the river is $3\frac{1}{2}$ cables, with depths of 10 to 19 fathoms, the stream here being rapid, with eddies and whirls. Above this part the breadth varies between 4 and $1\frac{1}{2}$ cables; the shores are steep, and depths from 2 to 27 fathoms, with shallow patches in some places. At the village of Batu Panggal is the depôt of the East Borneo Coal Company, with a pier and mooring buoy below it; the eddies here are very strong, with many loose stones near the shores. Seven miles above Panggal, where the river turns northward, is the island of Gosong Jerang on the west side, with two steep points, Berhala and Batu Berhala, $2\frac{1}{2}$ miles north. In the middle of the river 6 miles above Batu Berhala, is the narrow island Tenggarung, which may be passed on either side in depths of 3 to 7 fathoms.

The large village Tenggarung, containing the palace of the Sultan of Kutei, is on the west bank, at the north end of the island. There is daily steamboat service with Samarinda, and weekly with Muara Jawa, and Balikpapan. The river has been ascended by a steam vessel for 170 miles above Tenggarung.

General charts 2636, 941b, 2660b, 1263, 2759a.

Chart 2636, Strait of Makassar, northern part. Var. 2° 30' E.

Coast.—Northward of the Muara Badak, the northern mouth of the Sungai Mahakan, the coast is flat, and affords no conspicuous points. The 100-fathoms line bends in towards the coast, and within are irregular depths.

Besides the previously described reefs north of Muara Berau, is a coral reef, which dries at low water, situated between the 3 and 5-fathoms lines, 6 miles to the southward of Tanjong Santan.

Tanjong Santan (*Lat. 0° 2' S., Long. 117° 31' E.*) may be recognised by a row of casuarina trees; the Sungai Santan, that flows out near the point, is only navigable for small vessels; a bank of sand and mud extends from the mouth.

Discoloured water, apparently indicating a reef, has been reported (1913) by the *S.S. Attaka*, 21 miles, 104° true, from Tanjong Santan.

Anchorage.—There is fair anchorage in 11 to 14 fathoms, soft mud, with Tanjong Santan bearing 272° true, and Barat basa 7° true.

Coast.—For 20 miles north of Tanjong Santan the coast for fully 3 miles out is foul, lined with reefs, and densely wooded islets generally flooded at high water, and uninhabitable. The principal of these are the Kerindingan islands, which can be seen in fine weather from a distance of 12 to 14 miles; to the southward is Barat basa, a white coral islet with a little wood in the middle and frequented by fishermen in search of turtles' eggs.

Bontang village, consisting of about 20 houses, can be reached through a passage in the coast reef, with depths of 5 to 23 fathoms, and marked by 3 beacons with triangular topmarks; entering, the first beacon is left on the port hand, and the two following on the star-board hand. It is advisable only to use this channel at low water, when the edges of the reefs can be seen.

Anchorage.—In a break in the coast reef, north of the Kerindingan islands, there is very good anchorage, sheltered in all seasons, in 8 to 11 fathoms. At high water small vessels can reach Bontang over the reef.

There is also fairly good anchorage in 15 fathoms, near the second beacon, in a basin formed by the junction of four gullies; from this anchorage Barat basa is just visible between the Kerindingan islands.

Reefs.—A coral reef, which dries at low water, lies 2½ miles from the coast, about 13 miles northward of the Kerindingan islands; one mile to the westward is another reef of 3 feet water. Near the 100-fathoms line, 4 miles, 133° true, from the first reef, is a coral reef of 3 fathoms.

Southward of these, numerous reefs, mostly drying at low water, and marked by discoloured water, lie within the 10-fathoms line.

Tanjong Sangatta is conspicuous from an inshore view, but cannot be determined from seaward. Sungai Sangatta, close northward

General charts 941b, 2660b, 1263, 2759a.

Chart 2636, Strait of Makassar, northern part. Var. 2° 30' E.

of the point, can be ascended by small steam vessels, the depth at the mouth being $2\frac{1}{2}$ feet at low water, and the channel over the bar is marked by pole beacons.

Sangatta reef (*Lat. 0° 20' N., Long. 117° 42' E.*), $7\frac{1}{2}$ miles, 129° true, from Tanjong Sangatta, and one mile outside the 100-fathoms line, consists of two portions; the southern part dries at low water, on the northern is a least depth of $1\frac{1}{2}$ fathoms. The reef is steep-to on the eastern side, and the discoloured water and ripples are visible from over a mile distant.

A coral reef, with a diameter of 330 yards, and a least depth of 4 fathoms over it, lies 2 miles, 320° true, from Sangatta reef, and about a mile within the 100-fathoms line.

Coast.—From Tanjong Sangatta the coast trends in a north-north-easterly direction to Tanjong Bungalun, and then curves to the eastward to Tanjongs Seglu and Pamerikan. Several small rivers flow out in this part of the coast, but except for the Sungai Bungalun, which can be entered by small steam vessels at high water, they are only navigable for native boats. In the northern part, immediately westward of Tanjong Seglu, is Telok Golok, which affords fair anchorage in 8 to 10 fathoms. A rock with 4 feet water over it lies at the entrance.

Between Tanjongs Sangatta and Bungalun is a hill 571 feet high, conspicuous by its wooded summit.

Westward of Telok Golok are the Bekarat (Sekarat) mountains, rising close to the coast, of heights of 1,850 to 2,179 feet; from a distance these have the appearance of an island.

Within the 10-fathoms line there are numerous coral reefs, some of which dry at low water, and it is advisable not to approach the coast within this depth. A rock with one foot of water over it lies 2 miles to the southward of Tanjong Bungalun, and is marked by a beacon with truncated cone topmark.

Reefs.—At 7 miles from the coast, midway between Tanjongs Sangatta and Bungalun, are three coral reefs; the northern and southern have 3 feet of water over them, the middle, $1\frac{1}{2}$ fathoms. A reef of 3 feet least water, and a diameter of about one cable, lies 8 miles, 97° true from Tanjong Bungalun.

Bungalun reef, shown in lat. 0° 33' N., long. 117° 58' E., is of doubtful existence.

Plan of Sangkulirang bay on 3031.

SANGKULIRANG BAY, like Balik Papan and other inlets southward, is the estuary of many streams emptying into the head of the great bight west of Tanjong Mangkalihat; the main and only river of importance is the Sangkulirang. The outer portion of the bay,

General charts 2636, 941b, 2660b, 1263.

Plan of Sangkulirang bay on 3031. Var. 2° 30' E.

between the entrance points, is known as Telok Kariang. The western shore is low, and the eastern hilly, both are heavily timbered. On either side are coral reefs, mudbanks, and islands, which leave between only a narrow lane of deep water from a half to one mile wide.

Miang besar, an island of raised coral, thickly treed to a height of 280 feet, and surrounded by a belt of mangrove, is 2 miles across and divided from the west point of the bay by a passage of deep water nearly 2 miles in width. The surrounding reef is not more than 2 cables wide, except on the west side, where it projects 3 cables. A black beacon marks the edge of the reef off the north point, and in the little bight south-west of the point, there is a settlement of the Kutei Exploration Company, with a small mole extending into 2 fathoms water.

Westward of the north point of the island are two detached reefs, which dry at half tide, the western edge being 3 miles distant; there is deep water between the two reefs, and between the eastern and the island. There is also, just within the 100-fathoms line, a coral reef with one fathom water, 4 miles, 267° true, from the south point of the island.

Plan of anchorage north of Miang besar on 3031.

Anchorage (*Lat. 0° 45' N., Long. 118° 1' E.*), with good shelter at all times, will be found on the north side of Miang besar, in 12 or 13 fathoms, mud, 2 cables from the reef in the line of direction of the pier, which will bear about 172° true. This anchorage is most conveniently and safely approached from eastward. Going west from here, it would be well to wait until the reefs to westward are dry, and to remember that the island reef only shows at low water. There is a small natural basin in the reef, immediately off the pier, with 6 and 7 fathoms water, suitable to vessels not exceeding 100 feet in length; local knowledge is, however, necessary to enter.

Islands and banks.—Miang kecil is a low mangrove-covered island, eastward of the south point of the bay; shoal water extends 2 miles eastward, and there is a narrow deep water passage on the west side, with a beacon on the mainland reef.

Rending island, 6 miles north of Miang kecil, is low, with cocoanut trees; there are two villages, and fresh water may be obtained. Two miles southward on the west shore is the red rocky point Tanah Merah, and a small hamlet; Sirbih is a small red rocky islet, with some vegetation; Senumpa, next northward, is thickly timbered; a small coral reef of less than 6 feet water lies 3 cables northward of it. All these islands are on the shallow bank, which lines the west shore for 2 miles out.

On the east side, Tanjong Batu is bold, with a small double top hill; one mile, 282° true, from the point is a small stony islet, with some brushwood; about 3 cables southward of the islet is a shoal with 1½ fathoms water, mud and sand.

General charts 2636, 941b, 2660b, 1263.

Plan of Sangkulirang bay on 3031. Var. 2° 30' E.

Southward of Tanjong Batu, an extensive bow-shaped mudbank, of less than 3 fathoms, lines the shore for 18 miles as far east as Tanjong Pagar, and at the widest point is $5\frac{1}{2}$ miles from the beach; the western edge of this bank, from half a mile off Tanjong Batu, runs in the direction of the inlet for 7 miles, and forms the east side of the channel.

In the bight (*Lat. 0° 56' N., Long. 118° 3' E.*) northward of Batu, which is filled with a bank of mud and sand, are the two islets Antung and Bajo, both overgrown. Jopang, $4\frac{1}{2}$ miles north-west of Bajo, is an island with a small hill on the west side.

Beacons.—A white ball beacon marks the stony islet off Tanjong Batu, and another similar beacon the edge of the shoal water further north. Two beacons, with black cones, mark the west side of the channel off Senumpa.

Godang, 2 miles north of Jopang, is a village with about 200 inhabitants, chiefly Chinese and Buginese traders, and a depôt of the Kutei Exploration Company; there is a pier for small vessels, and a few supplies can be obtained. Ships drawing 20 feet may come as far up as Godang. Above Godang the river speedily becomes narrow and choked by rocks and sandbanks.

Nearly in mid-stream, abreast Godang, is a rock which dries at low water; it is marked by a beacon with truncated cone topmark.

The least depth into Sangkulirang bay is $3\frac{1}{2}$ fathoms, on the bar 2 miles north-east of Miang kechil. The narrowest part of the channel is about 2 cables wide, between the shoal southward of the rocky islet westward of Tanjong Batu, and a 2-fathoms bank south-westward.

Directions.—The channel eastward of Miang kechil is 2 miles wide, but narrows to one mile when 3 miles south of Tanjong Batu; Rending island, Tanjong Batu, and the small islet off it are conspicuous. It would probably be necessary to mark the shoal southward of the little islet off Batu before passing between it and the hard bank of 2 fathoms nearly in mid-channel; from the little islet pass north-eastward of Senumpa island.

From the anchorage north of Miang besar, the narrow passage west of Miang kechil may be used by small steam vessels, by steering for the middle of Miang kechil, and into the passage when the beacon on the west reef is in line with the point a mile northward. When the north point of the island bears about 90° true, the beacon in line with the east side of Miang besar, will lead, in not less than 2 fathoms, into the main channel northward.

Tides.—At Miang besar, during the months of December to February (inclusive) double day tides prevailed, those of the evening being higher than the morning; only at neaps was a single tide in 24 hours sometimes observed. It was high water, full and change, at about VIh. Springs rose 8 feet; neaps 4 feet. The tidal streams were weak.

Chart 2636, Strait of Makassar, northern part. Var. 2° 30' E.

The coast east of Sangkulirang runs in an east-by-southerly direction to Tanjong Pagar (Paggar); the projecting bank may be rounded by keeping in 10 fathoms water. Tanjong Pagar (*Lat. 0° 49' N., Long. 118° 22' E.*) is a hilly ridge, with a strip of low mangrove-covered land at the base, and is very steep-to, the 100-fathoms line being less than a mile from shore.

Eastward of Tanjong Pagar is Telok Menumbar, largely filled by a bank of mud and sand, the eastern part being steep-to. The Sungai Menumbar flows into the bay, but can only be entered at high water by light-draught vessels.

Anchorage.—In the western part of the bay is good anchorage, in 8 fathoms, mud, with Bira-birahan island bearing 157° true, and Tanjong Pagar 259° true.

Coast.—Tindeh Hantu mountains, with peaks 1,400 to 1,722 feet above the sea, and heavily timbered, rise behind the shore between Tanjongs Pagar and Labuan Bini, a distance of 25 miles (view at page 378). Bakong bay is about 7 miles from Labuan Bini, between the low mangrove-covered Tanjong Menumbar and the high Pulu Setebah. From the middle of the bay a ridge with 20 to 25 fathoms water extends southward about 3 miles, with shallow places of 3 to 4½ fathoms near the southern part; on the west side of this ridge the water is very deep, and on the east side there are 25 to 35 fathoms, but there is no good anchorage.

Eastward of Pulu Setebah there is a small wooded islet close to shore, and in the light there is anchorage in 10 to 15 fathoms.

Tanjong Labuan Bini is low, and the shore continues so to Tanjong Mangkalihat, nearly 18 miles, with coast hills a little way within; the reef is narrow with some small islets on the ridge. Telok Sendaren, 6 miles from Labuan Bini, affords anchorage in 8 to 10 fathoms, with shelter from north-east winds; half a mile, 47° true, from Tanjong Jaran Jaran, the southern point of the bay, is a reef of 2½ fathoms. Northward of Telok Sendaren three islets lie near the coast.

Bira-birahan island, 9 miles from Tanjong Pagar, is of coral surrounded by a steep-to reef, which partly dries, and projects a considerable distance east, west, and south. The centre of the island is grown over with trees 138 feet high, near the shore is a belt of mangroves; it is uninhabited, and there is no fresh water. Temporary anchorage, in 20 to 25 fathoms, may be found in places one to 2 cables off.

Johanna Antonia, an oval-shaped coral reef half a mile long, with a least depth of 3½ fathoms, is 5½ miles, 70° true, from Bira-birahan; it is very steep around, and the water over is discoloured.

General charts 941b, 2660b, 1263.

Chart 2636, Strait of Makassar, northern part. Var. 2° 30' E.

Tanjong Mangkalihat, the most easterly point of Borneo, is the extremity of a mountain ridge extending far into the interior; the extreme is low and grown over with mangroves, but the water is deep, and it may be safely rounded at a distance of one mile. About 2 miles westward of the north-east extreme of the point the coast becomes rocky. (*See view on chart 2636.*)

Mount Mangkalihat rises to a height of 1,083 feet 2 miles from the coast, but is generally difficult to distinguish from the surrounding hills. Mount Antu, to the north-north-westward, 2,313 feet high, is very conspicuous from northward.

LIGHT (*Lat. 0° 59' N., Long. 118° 59' E.*).—A white flashing light every thirty seconds, showing a flash of five seconds duration, is exhibited, at an elevation of 134 feet above high water, from a white iron framework structure, 105 feet high, situated on the point about 2½ miles southward of Tanjong Mangkalihat. It is visible from a distance of 17 miles. For arc of visibility, *see* Light list and chart.

For continuation of coast of Borneo to the northward, *see* page 422.

Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

SOUTHERN ENTRANCE TO MAKASSAR STRAIT.—Between the eastern edge of the great Borneo bank and Spermonde archipelago, which projects from the west coast of Celebes, are a number of isolated coral banks, rising abruptly from great depths, with raised ridges and islands on the north and east edges similar to those found northward on the Borneo bank.

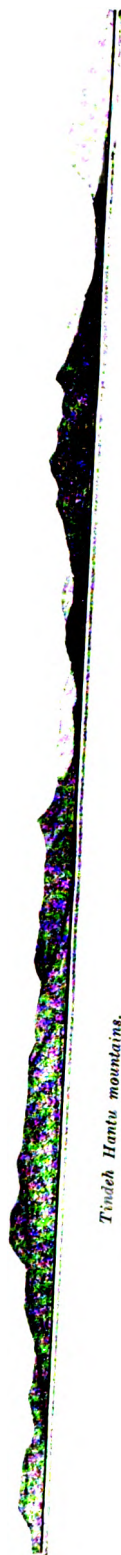
Sibbalds bank (*Lat. 5° 47' S., Long. 117° 6' E.*), the south-western, is, within the 10-fathoms limit, about 6 miles long, north and south, and 4 miles wide; the least water, near the centre, is 4½ fathoms. There is a depth of 7 fathoms 5 miles, 40° true, from the shoalest part, and a bank of 6 fathoms, 1½ miles in length, 15 miles, 124° true; more than 100 fathoms water is found in all directions around.

The large flat eastward of Sibbalds bank, extends north-eastward for 65 miles; over the southern half are very irregular depths from 10 to 50 fathoms, and in one place more than 100 fathoms, while the northern part is blocked by islands, reefs, and shoals.

Kalu Kalukuang, an island on the north-west edge of the flat, is 3½ miles long, covered with cocoanut trees, and may be seen 14 miles. There is a village on the north-west side, and the island is surrounded by a coral reef very steep on the northern side; the small islet Toko Toko lies on the southern side.

The 100-fathoms line extends for 18 miles to the north-eastward of Kalu Kalukuang, and then turns to the southward for 5 miles, to Butong Butongang, there being numerous patches of 3 to 5 fathoms close to its edge.

General charts 941b, 2660b, 1263, 2759a.



Tindeh Hantu mountains.

Borneo, east coast; Tindeh Hantu mountains.

Mangkalihat,
bearing 19° true, 36 m.

Allah Porang.

Chapia.

Lanti Anjoro.



Tanelle peak,
bearing 99° true, 7½ m.

Celebes, west coast northward of the Sungi Segeri.



Banko Bankoang.

Makassar, north approach; N.E. point of Banko Bankoang in line with
Sabuton. *Satando beacon,*
351° true, 1½ m.

Saputi.

Satando.

Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

Butong Butongang (*Lat. 5° 3' S., Long. 117° 55' E.*), the northern and smallest of these islands, is on the north-east edge of the flat, 5 miles from the north point; it is half a mile long, low, and covered with banana trees. The south-east side is very steep, but there is good anchorage on the reef in 3 to 5 fathoms, 2 cables off, on the western sides.

Banko Bankoang, 7 miles, 192° true, from Butong Butongang, is two-thirds of a mile across; the reef dries nearly half a mile from the south-west side, but at a less distance in other directions. There is anchorage, in 8 to 11 fathoms, all round the island.

Doang Doangang kechil, 4 miles southward of Banko Bankoang, is 4 miles long and very narrow; it stands on a dangerous reef of coral and sand, which extends in all directions for about 1½ miles, but native craft can anchor on the south-west side about 4 cables off. The island is thickly wooded with tall trees, and there are large banana gardens and some cocoa palms; owing to the difficulty of approach there are few inhabitants.

Doang Doangang besar, 4 miles south-south-eastward of the last island, is 3¾ miles long parallel to the edge of the bank, and one mile wide. The surrounding reef dries out three-quarters of a mile, the east side being very steep. The island is thickly wooded, and can be seen from a considerable distance; the village extends along the west side. Eight miles, 267° true, from the south point is a shoal of 3¾ fathoms, and at 4½ miles further south a patch of 5 fathoms, the southernmost danger on this part of the flat.

All these islands are inhabited generally by fishermen.

Marasindeh, 13 miles, 107° true, from Butong Butongang, is triangular in shape, each side being rather more than a mile in length; the shores are precipitous, a village extends along the west side, and a group of tall trees on the north point is visible a long way off. The reef surrounding the island dries off about 2 cables; there is anchorage westward of the west point in 3½ fathoms, and in 6½ fathoms north-north-west of the north point, both anchorages being half a mile from the island.

Karang Marasindeh, 5 miles, 204° true, from Marasindeh, is a coral reef nearly a mile long, steep-to, and without anchorage; the north and south points show at high water, and the whole reef uncovers at low tide.

Laars banks consist of three isolated coral reefs 40 miles in length in a general north-north-easterly direction, and a fourth portion 10 miles south-eastward of the central part, with very deep water around them; the bottom is generally of fine white sand.

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 20' E.

Bone Laingsi (Laisi), the southern reef, is 20 miles in length, with a ridge of less than 10 fathoms along the north-east side; the least water, 6 fathoms, is 3 miles from the north end. Pisani bank, of 12 fathoms, lies at the south-east end.

Bone Poete is separated from Bone Laingsi by a deep channel 2 miles wide, through which the current runs with strength, causing rippings and a troubled sea. The least depths, of $3\frac{1}{2}$ fathoms, are near the north edge.

Karang Dewakang, the northern portion of Laars bank, is 14 miles long and 5 miles broad, full of reefs and shallows, with the islands of Dewakang besar and Dewakang kechil upon the ridge along the eastern side.

DEWAKANG KECHIL (Laars island), on the east edge of the reef, 7 miles from the south point, is half a mile in length, and thickly covered with cocoanut palms; the encircling reef dries out about half a mile.

Dewakang besar is about one mile long, and half a mile wide, and with its reef, forms the north point of Karang Dewakang; the reef on the west, north, and east sides cannot be approached. From the south point a ledge projects nearly 3 miles southward, and from the east point 4 miles south-eastward, forming a funnel-shaped fairway by which vessels of 12 feet draught may approach the island, but the channel is encumbered with many shoals and drying rocks; it may be reached from eastward by passing rather over one mile south of Dewakang kechil, until the east point of Dewakang besar bears 2° true, a course then on that bearing until the south point of the island is 340° true, will lead to anchorage in 6 fathoms. The least depth on the ridge south of Dewakang kechil is 13 feet. From westward, the north point of Dewakang kechil, bearing 105° true, may be steered for until, as above, the east point of Dewakang besar is 2° true. At the south-east side of Dewakang besar is a stone pier for the use of praus. The native chief of the islands resides here.

Karang Bankauluang, south-east of Bone Poete, is 7 miles in length, with 5 to 7 fathoms water, and like other banks is very steep-to. In 1910 a reef of 5 fathoms was reported to lie about 7 miles to the south-south-westward.

Tonyn island (Bankauluang) (*Lat. 5° 30' S., Long. 118° 38' E.*), 10 miles east of Dewakang kechil, is 8 cables long by $2\frac{1}{2}$ cables wide. The island is covered with cocoanut palms, which are highest on the north-east and south points; it is not permanently inhabited, and there is no anchorage.

General charts 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, southern part. Var. 2° 30' E.

Tides.—In February, March, and April, at the time of the moon's greatest declination, there was but one tide in 24 hours, and about the period of the moon crossing the equator, two tides were observed; midway between maximum and minimum declination, both were equal in height. The range of single tides was 5 feet, and of the double 2 feet.

During the month of November, only one tide was seen, with a small rise and fall of about 6 inches midway between, when the moon's declination was greatest. The extreme range was nearly 6 feet; high water was in the evening and low water in the morning.

The directions of the current were at all times irregular.

Taka Rewataja (De Bril bank), a very dangerous bank directly in the track of ships bound to Salayar strait, is about 4 miles long by 2 miles wide; with a fresh breeze there is a continuous line of breakers round the edge of the reef.

LIGHT (Lat. 6° 5' S., Long. 118° 54' E.). — From a white octagonal tower with three galleries, 75 feet high, on the south-west edge of Taka Rewataja, at an elevation of 68 feet above high water, is shown a *fixed and flashing light every half minute*, thus:—fixed, *eighteen seconds*; eclipse, *four and a half seconds*; flash, *three seconds*; eclipse, *four and a half seconds*. The light is visible 14 miles.

TAKA BAKANG (Teignmouth bank), 25 miles east-north-eastward of Marasindeh, about 2 miles long in a north-west direction, and 1½ miles broad, dries at low water, with exception of a part at the west end; it is steep-to with very deep water around, and being composed of dark coral is indistinguishable at high water.

WEST COAST OF CELEBES.—Approaching the south-west coast of Celebes from south or west, under favourable conditions of weather, Mount Lampo Batang, or the Peak of Bonthain, 9,981 feet high, will be sighted long before the off-lying islands and low wooded shores are visible; from the peak spurs and ridges extend to the broad plain towards the sea. In the eastern monsoon the coast is seldom sighted at a greater distance than 8 or 10 miles, and in the opposite season heavy rains frequently hide the mountains from view. The rivers are suitable only for boats and small vessels; bars with about a foot water generally block the mouths. Villages may be known by the surrounding groups of cocoanut trees.

General charts 941b, 1263, 2759a.

Chart 1293, Approach to Makassar. Var. 2° 30' E.

Four miles south of Ujong Laikang, the south-west point of Celebes, the bank, of 9 to 15 fathoms, drops rapidly into great depths, and the 100-fathoms line turns west and north-west, forming the boundary of the large flat of Spermonde archipelago. Southward of Ujong Laikang and into the strait of Tana Keke, mud and black sand, stirred up by rapid currents, will discolour the water and prevent dangers being seen, but westward of Makassar, where mud is seldom met with, the clearness of the sea is often very great.

Ujong Laikang (*Lat. 5° 37' S., Long. 119° 27' E.*), is not conspicuous, but at Ujong Barojaja, 2 miles north-westward, are two dark coloured rocks which show well against the sandy shore. Tall trees along this part grow close down to the water, but the hill ridge within is not wooded. Two cables westward of Ujong Chambataimeong is a rock awash at low water, named Batu Galingang.

Shoals.—Taka Luwara, a small sand and coral patch of $4\frac{1}{4}$ fathoms, lies 4 miles, 241° true, from Ujong Barojaja. Manrantusang, of $4\frac{1}{2}$ fathoms, lies $4\frac{1}{2}$ miles to the northward, in the middle of the southern entrance to Tana Keke strait; 5 cables, 160° true, from it is a depth of $2\frac{3}{4}$ fathoms.

About 2 miles southward of Ujong Barojaja is a shoal of 4 fathoms; 2 miles south-westward and one mile westward of Ujong Chambataimeong are shoals of $4\frac{1}{4}$ fathoms.

Tana Keke strait, bounded on the eastern side by the coast of Celebes between Ujongs Chambataimeong and Parapa, on the western side by Tana Keke, is about 5 miles broad at the southern entrance, though partly blocked by the above-mentioned Manrantusang reefs. The northern entrance is about $1\frac{1}{2}$ miles broad between the reefs on either side. The depths in the strait vary from 6 to 16 fathoms.

Malamuang bank, consisting of one large shoal with a least depth of 8 feet over it, and numerous smaller ones, lies on the eastern side of the strait to the southward of Ujong Parapa, and $1\frac{3}{4}$ miles off-shore.

Buoys.—On the eastern side of the northern entrance to Tana Keke strait is a white conical buoy with ball topmark, marking the edge of Malamuang bank; on the western side is a black can buoy with truncated cone, moored on the north-eastern side of the reef off Tana Keke.

Tana Keke is a low island, thickly overgrown, with some taller trees on the southern side and an isolated clump on the north-eastern point. On the south-western side is a shoal bay with an islet at the entrance, and a very conspicuous tree, the tallest in the island, on the west shore. A great part of the coast reef is covered

General charts 2637, 941b, 1263, 2759a.

Chart 1293, Approach to Makassar. Var. 2° 30' E.

with brushwood, so that the extremes of the island can only be determined at a short distance, and the island itself is not visible further than 10 or 11 miles.

The villages Tompotana and Kalukuwang lie on the eastern side, and can be reached through gullies in the coast reef.

Pulo Bauluwang is separated from the north-western side of Tana Keke by a partly examined channel about a mile wide, with 8 fathoms water, and from Pulo Satanga to the northward by a narrow, shallow passage. In the middle of the south-east coast of Bauluwang is a conspicuous isolated tree; on the south and west sides the coast is overgrown with brushwood. Half a mile to the westward is a patch of 3 fathoms.

Pulo Dajang Dajangan lies 3 miles to the north-westward of Satanga, with a channel of 12 to 19 fathoms water between, frequently used by vessels approaching Makassar from south-westward. The island is almost surrounded by a drying reef extending 2 to 3 cables on the south and west sides and steep-to.

LIGHT (*Lat. 5° 24' S., Long. 119° 11' E.*).—From a white iron framework, 98 feet high, situated on the south-east side of Pulo Dajang Dajangan, is exhibited, at 105 feet above high water, a *white flashing light every fifteen seconds*, thus:—flash, *five seconds*; eclipse, *ten seconds*. It is visible from a distance of 15 miles, but is obscured behind the high land of Tana Keke.

The coast of Celebes from Ujong Parapa turns northward for 6 miles to Tanjong Galesong; the little Pulo Sanra Bengi lies on the coast reef three-quarters of a mile westward of the latter point, and is covered with cocoa-nut palms; the reef dries to one-third of a mile westward. From north and south this islet is a good landmark, but from westward is difficult to distinguish from the coast behind. From here the coast bends slightly eastward for 10 miles to Tanjong Bunga, with numerous villages and the mouths of several streams and creeks along the shore.

Plan of Makassar road on 2662.

Taka Bubujang, a round stony patch one cable in diameter, with a least depth of $3\frac{1}{2}$ fathoms over it, lies $1\frac{3}{4}$ miles to the south-westward of Tanjong Bunga.

Taka Pinjing, a small reef of $1\frac{1}{4}$ fathoms, lies 5 cables, 302° true, from Tanjong Bunga.

Buoy.—The western side of Taka Pinjing is marked by a white conical buoy with ball topmark.

Chart 1293, Approach to Makassar.

Islands and dangers in the southern passage to Makassar.—Besides the islands and dangers close to the Celebes

General charts 2637, 941b, 1263, 2759a.

Chart 1293, Approach to Makassar. Var. 2° 30' E.

coast just described, the following lie westward of the line between Pulo Dajang Dajangan and Kudingareng Lompo.

Gosseia, the western of these, about 4 miles long, in a north and south direction, and 2 miles broad, lies 13 miles to the westward of Pulo Dajang Dajangan, and has three shoal places of $2\frac{1}{2}$ to 3 fathoms on it, generally marked by discoloured water.

Pontopontowang, a small shoal of $3\frac{3}{4}$ fathoms, lies 9 miles, 257° true, from the lighthouse on Pulo Dajang Dajangan. From here the summit of Mount Bontomanai is a little to the southward of the highest tree on Pulo Satanga, this island being just visible.

Taka Patappa and Taka Dange, two extensive banks of from 6 to 10 fathoms, lie near the 100-fathoms line, the former at from 6 to 10 miles south-westward, and the latter from 8 to 12 miles southward of Pulo Dajang Dajangan.

Batuna Garumbang, with a least depth of $4\frac{3}{4}$ fathoms, lies 3 miles, 254° true, from Pulo Dajang Dajangan.

Bone Pinjing, a rock with $3\frac{3}{4}$ fathoms least water over it, lies $5\frac{1}{2}$ miles, 14° true, from Pulo Dajang Dajangan. Two miles to the north-westward is Bone Luere, with $6\frac{1}{2}$ fathoms least water, and 6 miles further in the same direction, a shoal of 6 fathoms least water, named Bone Malonjo.

Bone Kaluku, a coral reef of $4\frac{1}{2}$ fathoms, lies 4 miles northward of Bone Pinjing.

Bone Pama Keke and Bone Pamalompo, both of $4\frac{1}{2}$ fathoms, lie, respectively 3 and 2 miles to the northward of Bone Kaluku. From the first-named reef the summit of Mount Maros is just to the northward of Pulo Samalona.

Plan of Makassar road on 2662.

Pulo Kudingareng Lompo (*Lat. $5^\circ 9' S.$, Long. $119^\circ 16' E.$*) is 4 cables long, wooded with high trees, and is one of the largest and most thickly populated islands of the Spermonde archipelago. On the east side the encircling reef is narrow, but projects southward 8 cables, with two dry sandbanks near the edge, and on the west and north sides 4 cables. The island is seen 14 miles off.

Pulo Samalona, 5 miles east-north-eastward of Kudingareng Lompo, is small, thickly covered with cocoa palms, and visible 12 miles. The surrounding reef is very narrow on the east side, but extends 3 cables on the west and north-west.

Taka Bako, a reef with 3 feet over it and deep water around, lies

General charts 1293, 2637, 941b, 1263, 2759a.

Plan of Makassar road on 2662. Var. 2° 30' E.

1½ miles, 112° true, from Samalona, and is seldom marked by discoloured water.

Great Lae Lae shoal, the southernmost of the reefs protecting the anchorage off Makassar, is one mile in length; on the east edge of the shoal is a grassy islet, 3 feet high, which is 6 cables, 246° true, from Fort Rotterdam light.

Little Lae Lae shoal is half a mile in extent, and has a small islet 3 feet high at the east end. Almost midway between Great and Little Lae Lae shoals are a number of rocks, with 2 feet least water.

Beacons.—A beacon with black triangular topmark is on the eastern side of Little Lae Lae shoal; a similar beacon with white topmark on the northern extreme.

Hoofd reef (*Lat. 5° 8' S., Long. 119° 24' E.*), on the south-eastern side of Little Lae Lae, is of less than 3 fathoms water.

Gosong Boni, northward of Little Lae Lae, is half a mile across, and is said to be extending southward; on the small islet on the eastern side, is the petroleum store.

The narrow passage between Boni and Little Lae Lae shoals, is 200 yards broad, with 9 to 11 fathoms. In the western monsoon this passage is convenient to vessels from northward, bound to the north part of the road, and thereby avoid having to beat up from the southward. A black stone pyramid, with a white vertical stripe, on the shore, in line with a white triangle on the roof of a stone house, 117° true, leads through in mid-channel; as these objects are but a short distance apart, they should be kept exactly in line. The north point of Barang Keke islet, 296° true, will lead to this mark. (*See view on chart 2662.*)

Gosong Panjoa, northward of Boni, is the last of the reefs which shelter the roadstead; the submarine cable to Bali and Java passes between this shoal and Boni. Off Ujong Tanah two white buoys, each with the Netherlands flag, and marked "Telegraafkabel," show position of cable; anchorage here is forbidden.

All the above shoals are steep-to, and in the month of July, when the mean water level is lowest, they dry at low water over the greater part.

MAKASSAR ROAD is, outside Java, the most important trading port of the Netherlands East Indies. The anchorage, between the town and a line of coral reefs half a mile from shore, is safe at all times, the holding ground is good, and the depth of water 7 to 10 fathoms. Although in the western monsoon it may blow hard and some sea set in, it seldom happens that ships discharging at the wharves are compelled to leave their berths.

General charts 1293, 2637, 941b, 1263, 2759a.

Plan of Makassar road on 2662. Var. 2° 30' E.

The road is limited on the northern side by a line from Gosong Boni to Ujong Tanah; on the western side by a line over the middle of Gosong Boni and the island on Great Lae Lae shoal; on the southern side by the line from the light-beacon on Great Lae Lae to Mariso lighthouse.

LIGHTS.—A *white flashing light every three seconds*, showing a flash of *one second* duration, is exhibited at 29 feet above high water, from a black framework on piles, 25 feet high, on the south-eastern edge of Great Lae Lae shoal. It is visible from a distance of 10 miles.

At Mariso, in the bight $1\frac{1}{2}$ miles southward of Fort Rotterdam, from a white iron frame, 46 feet high, a *fixed light*, with *white* and *red* sectors, is exhibited; the *white* light is visible 10 miles, and the *red* 5 miles. For sectors, *see* Light list and chart.

From a stone tower, 46 feet high, lower part white, upper red, on the west side of Fort Rotterdam (*Lat. 5° 8' S., Long. 119° 24' E.*), is exhibited a *fixed white* light, 46 feet above the sea, and visible 12 miles.

On the pierhead immediately north of Fort Rotterdam are two *red* harbour lights.

Beacon.—A white stake beacon, with ball, in $1\frac{1}{2}$ fathoms, marks the edge of the reef extending from Fort Rotterdam.

Light-buoy.—A black light-buoy, exhibiting a *fixed red* light, is moored on the north-eastern side of Hoofd reef.

Tides.—The tide at Makassar is almost purely single-daily when the moon's greatest declination falls 4 days after the quarters, and double-daily, though with frequently a smaller range, about the second half of March and September, when full and change is 4 days before 0° moon's declination.

The single-daily tide has high water on 1st January, about VIIh. p.m.; 1st April, about Ih. p.m.; 1st July, about VIIh. a.m.; and 1st October, about Ih. a.m. Springs occur one day after the moon's greatest declination, with a rise of nearly 4 feet about the second half of June and December, and $2\frac{1}{2}$ feet about the second half of March and September. Neaps fall one day after 0° moon's declination, with a rise of $1\frac{1}{2}$ feet about the second half of June and December, and imperceptible about the second half of March and April.

Double-daily springs fall 5 days after full and change, with a rise of fully one foot and high water at VIh. 30m.; neaps occur the same interval after the quarters with a very small rise.

The high and low waters of both spring tides cannot fall together; the highest water level is reached one day after the moon's greatest declination, about 1st January, at VIIh. p.m., and 1st July, at VIIh. a.m.

General charts 1293, 2637, 941b, 1263, 2759a.

Plan of Makassar road on 2662. Var. 2° 30' E.

Land and sea breezes.—In the approach to Makassar during the east monsoon, the sea breeze sets in about 10 a.m., and often blows with considerable strength from south-south-west to south-west. The land wind is less strong, and comes off between 6 and 7 p.m., from south-south-east to east, and is often strongest about sunrise. In the west monsoon, which sets in about December, with squalls and much rain, the wind is from west to north-north-west, the land breeze is seldom felt, and then only from a direction southward of east.

At the outer edge of the flat near Pulo Langkai, in the eastern monsoon, the sea-wind will blow from south to south-west for a short time each day, then turning again towards south-south-east and south-east.

Chart 1293, Approach to Makassar; plan of Makassar road on 2662.

DIRECTIONS (S.E. Monsoon) from southward to Makassar road:—Sailing vessels in the south-east monsoon, generally make the land eastward of Tana Keke, and can then with advantage pass through the strait east of that island. The deepest water is on the west side of the strait, and may be taken with Pulo Sanra Bengi bearing 0° true, until off the black buoy on the west side, then a more westerly course.

If the bank be reached westward of Tana Keke, the passage east of Pulo Dajang Dajangan (*Lat. 5° 24' S., Long. 119° 12' E.*) should be chosen; in case this is not possible, then westward of that island. If the wind here is too scant to make way to the northward, it may be confidently expected that the sea breeze, especially northward of Pulo Sanra Bengi, will towards mid-day be strong from south-westward. Ujong Tanah will, from this direction, be conspicuous from a considerable distance, and on nearing the road, Fort Rotterdam flagstaff bearing 41° true leads north-westward of Taka Bubujang and Taka Pinjing and south-eastward of Great Lae Lae. Approaching from the west a course 92° true may be steered for the old magazine northward of Mariso until Rotterdam flagstaff is 41° true; keep this bearing on until Great Lae Lae islet bears 300° true, when steer northward for the anchorage.

At night, the edge of the bank should be crossed with Pulo Dajang Dajangan light bearing northward of 38° true, taking the passage between Pulos Dajang Dajangan and Satanga; the light may be passed at a short distance, and kept westward of 194° true will clear Bone Pinjing. Shortly after passing this shoal the light of Fort Rotterdam will be seen, and the *white* sector of Mariso light, bearing 45° true; when the *red* sector of the latter is entered steer to pass a quarter of a mile south-eastward of Great Lae Lae shoal light, then turn northward to the anchorage.

Leaving Makassar road, sailing vessels should quit with the land

General charts 2637, 941b, 1263, 2759a.

Chart 1293, Approach to Makassar. Var. 2° 30' E.

wind, which blows strongest at sunrise, and if bound south, make as much westing as possible, in order to be ready for the sea breeze from south-west.

North-west monsoon.—Sailing vessels in this season falling to leeward of Pulo Dajang Dajangan, will find it most difficult to reach that passage, owing to violent squalls and an almost uninterrupted current to east-south-east; it is then best to anchor on the bank, and await more favourable conditions, at night, to work up near the shores; outside the edge of the flat this seldom succeeds. Nor is Tana Keke strait available, especially in January, when the current is nearly always to the south-east, with frequent violent squalls; the sides of the channel also cannot be approached by the lead, and there are no serviceable marks.

The edge of the shoal water should therefore be made well to windward of Pulo Dajang Dajangan, with the trees of that island clearly visible, a bearing of the island, or light, at such time, will give a good position on the chart. Should the bank be reached without either Pulo Dajang Dajangan or Pulo Langkai being in sight, the vessel will almost surely be near the Gosseia shoals, and must immediately run south into deep water, and south-eastward until the former island is seen.

The channel east of Pulo Dajang Dajangan may be used, but if well to windward, it would be desirable to pass west, and by keeping the lighthouse bearing southward of 191° true, will lead west of Bone Pinjing shoal. The course from Dajang Dajangan is 34° true, but sailing vessels are recommended to steer north as much as possible, until well past Pulo Sanra Bengi, to avoid being set by wind and current on to the Celebes coast.

Steamships making more direct courses over this ground must remember that the currents are variable, and may run with considerable strength.

The route most generally used is between Pulos Dajang Dajangan and Satanga; a course about 32° true will take a vessel clear of all dangers; when Taka Bubujang and Taka Pinjing have been passed, steer to pass a quarter of a mile south-eastward of Great Lae Lae light beacon, and to the anchorage.

Makassar town (*Lat. 5° 8' S., Long. 119° 24' E.*), which is the residence of the Governor of Celebes, has a frontage of nearly 2½ miles; the old town, formerly called Vlaardingen, is northward of Fort Rotterdam, and built in European style, with broad, tree-planted streets crossing at right angles. The town southward of Fort Rotter-

General charts 2637, 941b, 1263, 2759a.

Plan of Makassar road on 2662. Var. 2° 30' E.

dam is inhabited by Chinese and other merchants. The land surrounding Makassar is low and swampy.

Quay.—The quay is about 1,650 feet in length, with warping posts and bollards, and a depth of 36 feet at low water alongside. Off the quay are a number of mooring buoys. There are three piers, one immediately southward of the quay, and a coaling and petroleum pier northward of the town.

Population.—In 1905 the population of Makassar was 26,145, including 1,659 Europeans and 4,672 Chinese.

Pilots.—A Government pilot may be obtained at Makassar. There are no tugs.

Quarantine is under the usual regulations. Sailors are admitted to the military hospital.

Supplies of any kind can be obtained. Water can be supplied at the quay, or taken to the anchorage in floating tanks.

Coal is obtained at the northern wharf of the town. Vessels alongside secure to piles on shore, with off-fasts to the mooring buoys; in the east monsoon the ship's head should be south, and in the west monsoon to the north. In 1912, there were some 5,000 tons of Government coal in stock.

Communication is maintained by steam vessels of the Royal Dutch Packet Company with Singapore, Surabaya, Java, North Celebes, &c., fortnightly, and eastward with the Moluccas. Also every month on the return voyage of the Java-Australia line.

Telegraph.—A cable is laid from Ujong Tanah to Buleleng, and thence to Java; also to Balikpapan, on the east coast of Borneo.

Trade.—The imports at Makassar are cotton and manufactured goods, hardware, opium, petroleum, and rice. Exports are bird skins, coffee, copra, dried fish, gums, pearl shell, rattan, spices, tripang, wax and wood. In 1912, 490 steam-vessels of 845,559 tons entered the port.

Chart 1293, Approach to Makassar.

Coast.—From Ujong Tanah (*Lat. 5° 7' S., Long. 119° 25' E.*) the coast turns to the eastward for 2½ miles to the mouth of the Sungai Tello, and is everywhere low and swampy. One mile eastward of Ujong Kasi Rukang, the north point of the river mouth, is the village Parang Lu, where a Controleur is stationed. From here the coast turns again to the northward.

Bulu Karampuang, a sharp, conical summit, covered with large trees, lies about one mile inland from the mouth of the Sungai Kaimba, at 2½ miles further northward.

Pulos Kuri Chadie and Kuri Lompo, about 2 miles northward of Sungai Kaimba, are two rocky islets separated from the

General charts 2637, 941b, 1263, 2759a.

Chart 1293, Approach to Makassar. Var. $2^{\circ} 30' E$.

coast by creeks. On the west coast of Pulo Kuri Chadie is the village of the same name, with two conspicuous trees to the northward. On the north point of Kuri Lompo, the northern islet, is another tall, conspicuous tree.

Off the above-described coast the 3-fathoms line lies from $1\frac{1}{2}$ to 2 miles from the shore, with foul ground inside; a large number of the reefs and rocks dry at low water, and are covered with tall grass.

Immediately northward of Kuri Lompo is the delta of the Sungai Maros, useless for vessels of any draught, as there is only one foot of water on the bank before the mouth at low water. About 7 miles inland is the village Maros, the head-quarters of the Assistant-Resident of the district.

Chart 3044, Ujong Jonga to Ujong Kassi.

Ujong Kassi.—Near this point, 11 miles north-eastward of Ujong Tanah, the Sungis Kanjatongang and Bawana Marana flow out; the mouth of the former is conspicuous by a dark clump of palms and the little village Bonté Nompó.

Binanga Sangkarang, $4\frac{1}{2}$ miles to the northward of Ujong Kassi, is one of the largest and deepest rivers on this part of the coast. There are depths of 3 to 4 fathoms for a distance of 4 miles up the river, but in the channel over the bank outside the mouth is a depth of only 4 feet; the rise of tide is about 6 feet. Batu Pung Hati, a reef with less than 6 feet water, lies just within the 5-fathoms line, 2 miles west-south-westward of the mouth of Binanga Sangkarang.

Sungi Pangka Jene rises on the northern slopes of Mount Maros and splits into two arms, the Towa and Tanga, by the village of the same name. Northward of this the mudbank along the coast becomes narrower, the 3-fathoms line lying about one mile from the shore.

Mountains.—Bulu Bulu hill (*Lat. $4^{\circ} 49' S.$, Long. $119^{\circ} 30' E.$*), wooded with high trees, lies on the coast and can be seen from a distance of 12 miles, appearing as an island, the surrounding low land not being visible. To the north-eastward are the Bungoro mountains, extending in an easterly direction to 4 miles from the coast; Bungoro peak is an isolated, pointed summit almost in the middle of the ridge.

Coast.—Northward of Ujong Tua, in lat. $4^{\circ} 45' S.$, the 3-fathoms line curves out to more than 4 miles from the coast; the islands and shoals within are too numerous to be described here. The Sungai Segeri, 8 miles from Ujong Tua, can be entered through a channel,

General charts 2637, 941b, 1263, 2759a.

Chart 3044, Ujong Jonga to Ujong Kassi. Var. 2° 30' E.

with 2 feet least water at low water. The village of the same name, connected by a good road to Makassar, lies 4 miles up the river.

Between Pulo Panikiang, in lat. 4° 22' S., and Pare Pare bay the 5-fathoms line runs close along the coast, which is broken by numerous small bays and points.

Mountains.—Lanti Angoro, 5 miles eastward of the mouth of the Sungai Segeri, has three summits, the two western being marked on the chart. Chapia (Chopping) has two peaks close together. Tanette peak (Gunong Mandalle, Bulu Chongki, or Sunkolang), 1,675 feet high, is very sharp and conspicuous; Allah Porang has a blunt, steep summit. View at page 378.

Mount Barru (Bulu Maganjing or Gunong Lajari) (*Lat. 4° 26' S., Long. 119° 37' E.*), thickly wooded, and half a mile from the coast, is very conspicuous from the southward. Batu Karbouw (Bulu Ali-pang), nearly 7 miles to the north-north-eastward, has four small peaks close together, the western slopes being very steep, but it is not very clearly defined against the higher land behind. Lappo Kri Kri, 6½ miles further northward, is the most conspicuous conical summit of the Nepo mountains.

Plan of Pare Pare bay on 3128.

Batu Tollong, southward of Pare Pare bay, is a very conspicuous hill, with gradual slopes on the north-western side, and steep on the east and south-west sides. Batu Kiki, to the northward of Batu Tollong, can be recognised by the small crown-topped trees on the summit.

Chart 2637, Strait of Makassar, south part.

SPERMONDE ARCHIPELAGO, a great area of coral islands, rocks, and banks, stands upon a flat off the south-west side of Celebes, which, within the 100-fathoms line, extends westward from Tana Keke 20 miles, irregularly northward for 70 miles, then turns abruptly east, and again joins the coast in lat. 4° 20' S.; the north and north-west edges of these banks are still imperfectly known. The islands are generally planted with cocoanut trees, and form good marks; in clear weather the hills of Celebes are seen far off, Mount Maros, north-eastward of Makassar, being very conspicuous. Large quantities of fish are taken, and dried for local consumption and export.

Northward of lat. 5° 10' S. the usual raised ridge immediately within the 100-fathoms line, is very pronounced, and in many places rises above the level of the sea; southward of that parallel the ridge is lower and more broken, so that only in two parts is there danger to crossing vessels, but a reliable chart is essential to safety.

General charts 1293, 3044, 2637, 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, south part. Var. 2° 30' E.

Winds.—In the Spermonde archipelago a south-east and north-west monsoon prevail. The former sets in about the latter half of April, reaches its full force in May, and continues till September or the beginning of October. The average direction of the wind during these months is south-easterly, but the direction and force are considerably influenced by the land and sea breezes. At night the wind veers round more to the eastward; in the day time a south-westerly sea breeze is frequent, setting in about 11 a.m. and lasting till sunset.

In July, August, and September, the “Brubu,” or mountain wind, is met with. The approach of these squalls, which usually come in the forenoon, is generally marked by a heavy sky and the land becoming very indistinct.

In October the wind varies from W.S.W. to South in the day time; at night, more to the northward. In November it is very changeable, coming from all points. In December, January, February, and March the north-west monsoon prevails, but blows with less force than the south-east monsoon, especially at night when opposed to the land breezes.

PASSAGES TO MAKASSAR through the Spermonde archipelago.—Besides the previously described southern route to Makassar there are three further passages through the Spermonde archipelago.

The northern or inner passage, close along the coast of Celebes, is buoyed and beacons, and is 50 miles in length from Tomisa reef (*Lat. 4° 21' S., Long. 119° 33' E.*) to Makassar road.

The north-western passage is about 35 miles in length from the open sea to Makassar, the least breadth in the fairway is about 8 cables, and there are everywhere sufficient points in view to fix the ship's position.

The western passage affords a more direct route to Makassar for ships coming from the westward.

That part of the Spermonde archipelago northward of Makassar is too full of dangers for navigation to be fully described here, and for details the latest charts must be consulted. The most prominent features in the above route are described herein.

Charts 3044, 1293.

Northern passage.—Buoys and beacons.—The northern passage is marked on the western side by a black conical buoy with ball on Tomisa reef; a white stone pyramid on Batu Lola; a white beacon with cone and ball on Batu Luar; a beacon with white ball on the north-east point of the coast reef projecting from Pulo Banko Bankoang; and a white stone pyramid on Barang Baringang.

General charts 2637, 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, south part. Var. 2° 30' E..

On the eastern side are white stone pyramids on Satando reef; Taka Tallu; and Batu Lua; and at the entrance to the road near Ujong Tanah, two white conical buoys, with the Netherlands flag, and "Telegraafkabel" painted in black letters.

Chart 3044, Ujong Jonga to Ujong Kassi.

Directions for northern passage.—Making for this passage from north-westward, the edge of the bank on which the Spermonde archipelago lies must not be approached unless a reliable position has been obtained from the Celebes coast to the northward. The most distinctive mountains on the Celebes coast for fixing the ship's position are Batu Kiki, Batu Tollong, Lappo Kri Kri, Batu Karbouw, Allah Porang, Tanette peak, Chapia, and Lanti Angoro. (*See page 391.*)

Tomisa reef (*Lat. 4° 21' S., Long. 119° 33' E.*) lies on the western side of the entrance to the northern passage, and is 8 cables long and 3 cables broad, with depths of one fathom over it; on the eastern side are the reefs extending from Pulo Panikiang. From a position half a mile eastward of the black buoy moored on the eastern side of Tomisa reef, a course, 199° true, will lead eastward of Bromo reef; the wreck of the steamship *Bromo* stands on the northern side of this reef, 47 feet above water, and visible 11 miles. When abreast Bromo reef, and the thickly wooded Pulo Puti Angin, under the Celebes coast, bears 104° true, alter course to 212° true, passing eastward of the white stone pyramid on the southern Batu Lola reef. In addition to the Celebes hills the position may be determined here by the low, sandy Kalaroang islands. When the palm-covered Pulo Sakaola bears 130° true, or Tanette peak bears 88° true, the wooded Pulo Laja will come in sight, and the white beacon with cone and ball on Batu Luar must be kept in line with the western side of this islet, on the course 185° true. Steering on this mark will pass 3 cables westward of the Gosong Tua Raja.

The white stone pyramids on the western Taka Tallu reef, and the drying reef west of Pulo Satando, will then come in line bearing 174° true; this mark leads through the shoalest water in this passage, 3½ to 6 fathoms, and eastward of the beacon on Batu Luar. On the west side of this channel is Pulo Sabuton, thickly wooded with high trees; on the east side, Pulo Sagara, covered with palms, and 2 miles to the southward, Pulo Sapuli. When abreast the south point of Sabuton course is altered to about 180° true to leave the beacon with white ball on the coast reef of Banko Bankoang to the westward, and the beacon on the reef west of Satando, close to the eastward; the channel here, between this reef and Pulo Banko Bankoang, a low island with a group of high cocoanut palms on the north-eastern

General charts 2637, 941b, 1263, 2759a.

Chart 3044, Ujong Jonga to Ujong Kassi. Var. 2° 30' E.

side, is only about 2 cables wide, but the reefs on either side are steep-to.

When through this narrow channel the north-east point of Banko Bankoang will come in line with the west side of Sabuton, bearing 341° true (view at page 378); this mark must be kept on astern until the stone pyramid on the western Taka Tallu reef bears about 182° true. Pulo Sapuli, bearing 0° true, well open eastward of Satando astern will pass about 3 cables eastward of the southern Batu Tello reef. The beacon on Taka Tallu lies about 45 yards inside the west point of the reef, and may be left about 2 cables to the eastward in depths of 7 to 10 fathoms, then brought in line with Sapuli astern until the stone pyramid on Batu Lua (*Lat. 4° 59' S., Long. 119° 27' E.*) is sighted.

Batu Lua reef is about one cable long and half a cable wide, the beacon being in the middle of the western side. Bunga Eija, with 5 feet water over it, and only visible by discoloured water under favourable circumstances, lies 8 cables, 320° true, from this reef; it is advisable, therefore, to steer close to the beacon, and then pass north-westward of it on a south-westerly course.

Chart 1293, Approach to Makassar.

Batu Lua beacon having been rounded, it may be brought astern, bearing 32° true, to pass westward of the 3-fathoms line off Batu Mandang, and steering towards the beacon on Barang Baringang, when it bears 182° true, keeping it just on the starboard bow; Pulo Balang Chadi must be kept well open westward of Pulo Mauang, and the least depth will be 4 fathoms.

Plan of Makassar road on 2662.

The latter beacon may be passed at 3 cables distance, and when bearing 272° true, course altered to 207° true, the conspicuous clump of palms on Ujong Kassi will be just on the port quarter; pass between the southern telegraph buoy and Gosong Boni.

Chart 3044, Ujong Jonga to Ujong Kassi.

Sailing vessels leaving Makassar by the northern passage, when abreast the Kalaroang islands, sometimes find it preferable to pass eastward of Pulo Puti Angin; the depths near the coast here are convenient for anchoring at night, and the following morning the land breeze can be made use of.

Chart 2637, Strait of Makassar, south part.

North-west passage to Makassar.—For the navigation of this passage, which provides a safe, deep, and easy route for vessels from the north or north-west, the following islands and dangers are of importance.

General charts 2637, 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, south part. Var. 2° 30' E.

Kapoposang, the western and largest island of the archipelago, is long, narrow, and planted with cocoanut trees; on the eastern side a few casuarina trees rise above the others, and from northward give the appearance of two islands. The coast reef, which dries in many parts, extends nearly 2 miles on the west side, is steep-to, and generally shown by surf; on the south side the reef is less steep, and there is anchorage in 5 to 9 fathoms.

A patch of 2 fathoms lies about 2 miles to the southward of the west point of the drying reef, and breakers and discoloured water have been reported 2 miles to the south-westward of this shoal.

LIGHT (*Lat. 4° 42' S., Long. 118° 57' E.*).—A white flashing light every five seconds is exhibited, at an elevation of 108 feet above high water, from a white iron framework 108 feet high, situated on the western point of Kapoposang. The duration of the flash is four-tenths of a second. It is visible from a distance of 16 miles.

Papandangang is thickly covered with fairly tall trees. The coast reef on the north and west sides is broad, on the east side it extends only about half a cable. Between this island and Kapoposang is a channel of 6 to 10 fathoms water, only safe when the reefs on either side are seen.

About $1\frac{3}{10}$ miles eastward of the coast reef extending from Papandangang is a rock which dries at low water, with a clear passage between it and the island of 6 to 10 fathoms water; the east side of the island there may be safely passed within a distance of one cable.

Kondongbali and Tambakulu are north and south of each other. Kondongbali, the northern and most thickly populated of the whole group, is thickly covered with fairly high trees, and can be seen from a considerable distance; on the east side of the surrounding reef is a dry sandbank.

Tambakulu is uninhabited and bordered with low vegetation, with a tall, round-topped tree in the centre, which is the first object seen from southward. The island is surrounded by a reef extending fully a mile on the north-west side; between the two islands is a narrow, deep channel.

Reefs.—At a distance of $1\frac{1}{2}$ miles, 102° true, from Tambakulu is a rock, which dries at low water; one mile, 137° true, from the same island lies a coral reef of one fathom least water.

Pamangangang is a low sandbank covered with shrubs; in the middle is a group of cocoanut palms, and a few isolated casuarina trees stand on the east point.

Suranti consists of two sandbanks covered with shrubs, forming one island in the east monsoon. Pamangangang and Suranti are joined by a reef, a great part of which dries at low water; almost midway between the islands is a dry sandbank.

General charts 941b, 1263, 2759a.

Chart 3044, Ujong Jonga to Ujong Kassi. Var. 2° 30' E.

Gosong Tuara is a sandbank about 4 miles to the north-eastward of Suranti; a coral bank of shoal water, and drying in parts, extends about $2\frac{1}{2}$ miles to the northward. Between Gosong Tuara and Suranti is a channel of 6 to 8 fathoms water.

Pulo Jangang Jangang (North Watcher), the northern island of the archipelago, is covered with scrub and a few low trees; the coast reef is narrow, but the island is difficult to approach owing to the numerous scattered reefs in the vicinity. About $3\frac{1}{2}$ miles to the south-eastward is Gosong Jangang Jangang, a dry sandbank.

All the above islands and dangers lie near the north-western edge of the Spermonde archipelago; the absence of good objects for fixing the ship's position make it advisable to avoid this part. Reefs are nearly always steep-to, and cannot be approached by the lead; discoloured water is best seen with the sun behind, and at a moderate altitude. Generally a reef exists where many mastless fishing boats are seen together. Long bamboo stakes, showing the position of the fish weirs, are always in deep water, and may be passed close to.

The following islands provide useful bearing points for the north-west passage:—

Pulo Sarappo (*Lat. 4° 53' S., Long. 119° 16' E.*), about 2 cables long and one cable broad, has a group of conspicuous trees on the south side. Sarappo Keke, a sandbank covered with low shrub, lies $4\frac{1}{2}$ miles, 336° true, from Sarappo.

Pulo Badi, 5 miles, 166° true, from Sarappo, is a small, thickly wooded islet, with a conical tree-top near the west point, the highest in the island; the surrounding reef partly dries and is steep-to.

Pulo Lumu Lumu, $6\frac{1}{2}$ miles, 219° true, from Sarappo, is covered with cocoanut palms, with a couple of higher trees on the north-west point; from the west only one tree top, on the south point, is seen above the surrounding wood.

Chart 1293, Approach to Makassar.

Pulo Bone Tambung, 4 miles to the southward of Badi, is not so thickly overgrown as the other islets. The east side can be passed closely; the coast reef extends to the southward for $1\frac{1}{2}$ miles, with varying depths of one to 7 fathoms. The above islets are not visible further than 14 miles.

Pulo Barang Lompo, 3 miles to the eastward of Bone Tambung, is wooded with tall trees, and visible 15 miles. Pulo Barang Keke, 2 miles to the southward, is covered with dark trees.

Chart 2637, Strait of Makassar, south part.

Directions for north-west passage to Makassar.—Approaching from northward or north-westward the ship's position

General charts 2637, 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, south part. Var. 2° 30' E.

can be fixed by the lighthouse on the west point and the high casuarina trees on the east point of Kapoposang, course being then shaped through the channel east of Papandangang. When the west point of Kapoposang comes in line with the north side of Papan-dangang, bearing 305° true, this mark must be kept on astern until Kondongbali is in line with Tambakulu, bearing 0° true, steering then 117° true for Pulo Sarappo. This latter course leads to the narrowest part of the passage, between Taka Tengah Tengah on the south side, and a reef of 3 fathoms, marked by a black can buoy with truncated cone, on the north side, the distance across being 8 cables. When close to the above buoy the opening between Kondongbali and Tambakulu will bear 319° true, and this mark must be kept astern, steering 139° true until Sarappo bears 92° true, course being then altered to 146° true; Tambakulu and Kondongbali disappear from sight here.

Chart 1293, Approach to Makassar.

Between Taka Tengah Tengah and Pulo Lumu Lumu, on the western side of the channel, are numerous reefs, nearly always visible by discoloured water; the Kassi reef partly dries at low water. On the eastern side are Bone Bonea, of $4\frac{1}{2}$ fathoms, and Taka Pulu Badi, a part of which is always above water.

The course 146° true is continued until Pulo Lumu Lumu is in line with Pulo Lanyukang (*Lat. $4^{\circ} 59' S.$, Long. $119^{\circ} 4' E.$*), bearing 268° true, steering then for Pulo Samalona in line with the south point of Pulo Barang Keke on the bearing 150° true; Pulo Badi is left to the eastward, and Pulo Bone Tambung to the westward. When the white stone pyramid on Barang Baringang, or Mount Patine, come in line with the south side of Pulo Barang Lompo alter course to 125° true, steering between Barang Lompo and Barang Keke; on this course Lumu Lumu will be just open to the northward of Bone Tambung.

Plan of Makassar road on 2662.

Approaching Gosong Boni and Little Lae Lae shoal, Pulo Barang Keke may be brought on the bearing 298° true, keeping this astern until the white triangular beacon on the roof of a stone house is in line with the stone pyramid near the shore, bearing 119° true; this mark leads between the shoals. See view on chart 2662.

The road may also be entered southward of Great Lae Lae shoal by steering a southerly course after Pulo Barang Lompo bears 92° true, leaving Pulos Barang Keke and Samalona to the eastward, and Kud-ingareng Keke to the westward, and steering for Mariso lighthouse when it bears 104° true.

General charts 2637, 941b, 1263, 2759a.

Chart 1293, Approach to Makassar. Var. 2° 30' E.

Western passage.—For the navigation of the western passage the following particulars are of importance:—

Pulo Lanyukang, about 4 cables long and one cable broad, is covered with low brushwood, above which stand up eight scattered trees, visible 11 miles. The surrounding reef dries half a mile westward, but is narrow on the east side; on the north side the depths increase gradually, the 3-fathoms line lying at 3 to 6 cables from the coast.

Pulo Langkai (*Lat. 5° 2' S., Long. 119° 5' E.*), 4 cables long and 2 cables broad, is thickly wooded, with a conspicuous clump of taller trees near the south-west point, which are seen 15 miles. The east point is sandy, with a few houses northward; the coast reef is steep-to, narrow on the north-east side, and extends about 3½ cables on the west side.

Channels north and south of Lanyukang.—The channel north of Lanyukang runs in an east-north-easterly direction, with depths of 20 fathoms (view at this page). The channel south of Lanyukang is close along the coast reef extending from the south side of the island, and has depths of 5½ to 14 fathoms.

The leading mark for the northern channel is the middle of the southern slope of the second mountain ridge north of Mount Maros, in line with the highest trees of Pulo Sarappo, bearing 71° true; the first mountain ridge north of Maros is a very conspicuous plateau, named Bulu Saraong. The stream frequently flows across the channel.

The mark for the southern channel is the highest tree of Pulo Badi, behind Lumu Lumu, bearing 84° true. From an elevation of 15 feet this tree comes in sight about one mile outside the edge of the bank, and appears like a small point above the horizon. The stream flows here in the direction of the channel.

Plan of Makassar road on 2662.

Pulo Kudingareng Keke (Little Deer island) consists of two sandbanks, the northern being covered with low brushwood and visible 6 miles. The surrounding drying reef is steep-to, and extends for 3 cables on the south-west side.

Chart 1293, Approach to Makassar.

Directions for western passage.—Approaching the western passage to Makassar from the northward or north-westward, the high trees on Langkai must not bear southward of 137° true until the leading marks for one of the channels are seen. On the edge of the bank the bottom may frequently be seen in 10 fathoms, and a westerly current will cause heavy rippings.

General charts 2637, 941b, 1263, 2759a.

Tandile peak.

Mt. Maros.

(a)

Surappo, bearing 71° true.

Mt. Lampo Batang.

(b)

Highest tree of
Pulo Budi.

Lumu Lumu, bearing
97° true.

Maja.

Bontomamai.

153° true.

(c)

Lanyukang.

Langkai.

Makassar, west approach; from the channel northward of Lanyukang.

Tengglang, bearing 317° true.

Salucutan, 19° true, 8 m.

(a)

Buntu Pusu.

Buntu Puang.

Buntu Letta.

Tirnan.

(b)

Battorai, bearing 80° true.

Celebes, west coast; Mampya road.

Chart 1293, Approach to Makassar. Var. 2° 30' E.

Entering by the channel south of Lanyukang the leading mark (page 398) is kept until Mount Bontomanai (*Lat. 5° 28' S., Long. 119° 37' E.*) bears 131° true just open northward of Kudingareng Lompo, steering then on that course; in case this mountain cannot be seen, it is advisable to keep a little to the southward of this course, after the east point of Langkai bears 182°, as the current sets to the northward.

If entering by the channel north of Lanyukang, this island can be rounded when the west point bears 182° true, steering on Mount Bontomanai when bearing 131° true.

When the high trees on Sarappo come in line with the east side of Lumu Lumu, bring the high tree on Langkai astern on the bearing 290° true, steering between the Seborong and Batunai Balo reefs, where the channel is only 8 cables wide. Kudingareng Keke will quickly come in sight, and the north sides of this island and Samalona in line, on the bearing 110° true, may be steered for until the north point of Kudingareng Lompo bears 142° true, course being then altered to 128° true.

Plan of Makassar road on 2662.

When Barang Keke is in line with Kudingareng Keke or Kudingareng Lompo bears 182° true, steer for Mariso lighthouse on the bearing 104° true, rounding the light-beacon on Great Lae Lae shoal to enter the road.

To enter the road by the passage north of Little Lae Lae, pass between Kudingareng Keke and Samalona on a north-easterly course, and bring Barang Keke astern on the bearing 296° true till the beacons are sighted.

Plan of Pare Pare bay on 3128.

Pare Pare bay, about 67 miles north of Makassar, is 4 miles long, north and south, and divided into two portions by a narrow passage; the inner part is known as Supa bay. In the outer bay the depths are 9 to 30 fathoms, and over the eastern part of the inner basin 6 to 8 fathoms, mud. The least water, in the narrows leading to Supa bay, is $4\frac{1}{4}$ fathoms, with deeper water on either side. There is good anchorage in both parts of the bay.

South-eastward of the entrance is the conspicuous hill Batu Tullong; Batu Kiki, a mile northward, is less prominent, and has some round-top trees on the summit. The shores slope gradually, and are covered with brushwood.

From Ujong Lero, the west entrance point, shallow water extends southward 4 cables, and lines the coast westward to the same distance. A sandy beach surrounds the point. Similarly from the east point,

General charts 2637, 941b, 1263, 2759a.

Plan of Pare Pare bay on 3128. Var. 2° 30' E.

Ujong Tonrangang, shoal ground extends off nearly to Taka Tallange. On the southern slope of the hill on Tanah Maeli, on the western side of the narrows, is a conspicuous round-topped tree, visible for a distance of 18 miles from seaward; in line with Ujong Lero, 20° true, leads westward of all dangers to southward.

The town of Pare Pare (*Lat. 3° 59' S., Long. 119° 37' E.*) stretches nearly a mile along the east side of the narrows, and is a place of some trade, exporting coffee, maize, rice, rattan, kamari, and kachang. Two mooring buoys are laid out near the Government pier.

Reefs.—Batu Pekichang, with 5 feet of water, lies nearly a mile to the southward of Ujong Tonrangang; Taka Tallange, of one fathom, is an isolated part of the reef extending from the same point.

Batu Bajangan and Batu Runga Paroi are two shoals north of Ujong Lero, with 9 and 4 feet water over them, respectively.

Batu Laubang lies on the eastern side of the bay, and is 3 cables long in an east and west direction, and half a cable broad, with a least depth of one foot.

Batu Tete, which contracts the narrows to 2 cables wide, lies 3 cables to the southward of Tanah Maeli, and is only covered at springs.

Buoys.—A white cylindrical buoy marks the western extreme of Batu Laubang, and a black can buoy the south-eastern edge of Batu Tete.

Tides.—In the month of January the spring rise was 5 feet, when the moon's declination was greatest, and single tides were then observed for three days. Afterwards there were two tides in 24 hours, and the least range was 2 feet, about the time of the moon crossing the equator.

Communication.—Steam vessels of the Netherlands Royal Steam Packet Company call at Pare Pare monthly, on the voyage from Makassar to Manado and Amboina, and fortnightly, on the voyage to Dongala and back.

Directions.—Entering the bay from westward, Ujong Lero must be passed half a mile southward, and not less than one cable eastward. When this point is rounded steer for Ujong Ujung, the point opposite Tanah Maeli, on the bearing 31° true, which course will lead between the white and black buoys.

Chart 2637, Strait of Makassar, south part.

The coast from Pare Pare bay trends in a north-north-westerly direction for 22 miles, to Tanjung Paria; a mile off-shore westward of Pare Pare the depth is 100 fathoms, but 7 miles northward the bottom is less steep, and as little as 5 fathoms is found a mile off. More northward about 16 miles from Ujong Lero, the 100 fathoms is 4½ miles from shore, and there is a flat within the 10-fathoms line.

General charts 2637, 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, south part. Var. 2° 30' E.

Eight miles north of Ujong Lero is the little Sungai Sadang, with about one foot water on the bar; half a mile westward of the river is a reef with 3 feet, and southward is a bank, where is anchorage in less than 5 fathoms. At Tanjong Ammani, 9 miles from Sungai Sadang, the 10-fathoms line is 3 miles off, then gradually closes the shore.

Tanjong Paria, and for some distance on either side, is bounded by a reef drying at low water and projecting more than half a mile. At the Sungai Bungi, 5 miles north-east of Tanjong Paria there is good anchorage, during the south-east monsoon, in 8 fathoms, with the river mouth 57° true. North of the river mouth the bottom is very foul.

From Tanjong Paria the coast has a northerly direction for 10 miles to the Sungai Binanga-karang, then bends to the westward to Mampya road, formed by some reefs 2 miles off-shore, at the west end of a long ridge of coral, enclosing the islands Karamasan, Tanggaë, and Battowaë, with some smaller islets.

Reefs.—Pasei Tangan, a coral reef of one fathom water, lies about 5 miles to the northward of Tanjong Paria; to the southward are two reefs of $1\frac{1}{2}$ fathoms. To the northward of these are numerous detached reefs extending out some 5 miles, and the whole of the bight should be avoided.

Plan of Mampya road on 3209.

Mampya road is between Battowaë, on the east, and Tanjong Mampya (*Lat. 3° 27' S., Long. 119° 17' E.*), on the west; Battowaë is 315 feet high, with a group of trees on its otherwise bare summit, and upon the reef, which extends westward $2\frac{1}{2}$ miles, are two small islets; a beacon, 16 feet high, and surmounted by a white ball, marks the west extreme of the reef. The passage in, half a mile wide, is west of Battowaë reef, with 25 to 35 fathoms water. There are many native villages along the shore, and several reefs in the eastern part of the bay.

The anchorage is in the western part of the enclosed basin, $1\frac{1}{2}$ miles east of Tanjong Mampya, in about 10 fathoms, sand and mud, sheltered from heavy swell by the protecting reefs.

Buoy.—A white conical buoy is moored on the eastern side of the entrance.

Directions (view at page 398).—The summit of Battowaë in line with Buntu Puang, 2,087 feet high, bearing 73° true, leads in until Saluwatan is 20° true; a course then on this bearing is through the deep entrance westward of Battowaë. The

General charts 2637, 941b, 1263, 2759a.

Plan of Mampya road on 3209. Var. 2° 30' E.

edge of the eastern reef is generally dry or marked by surf; the reef on the west side is less easily seen, and dries only at low water. The village Alli Alli has a market with a zinc roof, conspicuous from seaward.

Chart 2637, Strait of Makassar, south part.

The coast westward of Mampya is fairly steep-to, and on Tanjongs Buku and Labuang are considerable villages; in the reef projecting from the latter is a creek with 3 fathoms water. There is some foul ground for a half a mile off this shore.

Plan of Majene and Balangnipa roads on 2662.

Balangnipa road, $5\frac{1}{2}$ miles westward of Tanjong Labuang (Lat. $3^{\circ} 31' S.$, Long. $119^{\circ} 7' E.$), affords anchorage, with off-shore winds, to small vessels in 4 fathoms, on a spit, with the mouth of the river, bearing 335° true, distant about 8 cables. This anchorage is just southward of a coral pinnacle, with 11 feet water, and 2 cables to the northward of this pinnacle is a rock which dries at low water.

Majene road, a bay 2 miles east of Tanjong Rangasa, is sheltered from westerly winds, and there is anchorage in 15 to 17 fathoms, sand, in a break in the reef off the village of Majene; but there is here only room for one vessel. Eastward of this position ships may anchor on the edge of the reef in over 20 fathoms. Tanjong Bauru, the eastern boundary of the bay, appears at a little distance, as a low island detached from the high ground northward. West of the village the coast reef is very steep, and dries out one-third of a mile. Small quantities of refreshments may be obtained here. A pier has been constructed near the flagstaff of the Controleur's house.

Light.—A red fixed light is exhibited from the pierhead.

Communication.—There is monthly communication with Makassar by vessels of the Royal Dutch Packet Company.

Wind and weather.—In August and September, east and south-east winds blow with considerable force, with squalls, becoming more southerly in October, and in November unsteady, with calms, rain, and thunderstorms.

During the south-east winds, sea was slight on the coast as far up as Sungi Bungu, but on the northern shore of the bight a heavy surf was experienced.

Tanjong Rangasa (Cape Mandar) is a bold headland, rising gradually to the summit of the mountain range; and is seen at a great distance; the extreme of the point is low, with villages on the south and east sides. A reef, named Taka Sitodong, dries westward for 6 cables, and southward for 3 cables; on the south-west side of the

General charts 2637, 941, 1263, 2759a.

Plan of Majene and Balangnipa roads on 2662. Var. 2° 30' E.

cape the 100-fathoms line is nearly a mile from shore, and there are depths of 3 to 15 fathoms, on the submerged portion of the reef, where temporary anchorage is found. The tidal streams sweep round the edge of the reef 3 to 4 knots.

LIGHT (*Lat. 3° 34' S., Long. 118° 56' E.*).—A white group flashing light every ten seconds, showing two flashes of four-tenths of a second each; eclipse between flashes two and one-tenth seconds, between groups seven and one-tenth seconds, is exhibited, at an elevation of 246 feet above high water, from a white iron framework, 69 feet high, situated on Tanjong Rangasa. It is visible from a distance of 22 miles. For the arc of visibility, see Light list and chart 2637.

Chart 2637, Strait of Makassar, south part.

Coast.—From Tanjong Rangasa to Tanjong Rangas, northward nearly 60 miles, the coast generally rises abruptly from the sea, and is so steep that anchorage is only found in small bays occasionally met with, and the shore reef is always narrow. The mountain ranges form a high stony tableland, with a broken and fantastic outline, but there are no summits sufficiently conspicuous to guide vessels at sea.

The coast lands are thickly inhabited by fishermen and local traders; these are generally Mohammedans, and they have little communication with the savage tribes inland. Goats are plentiful, and fowls can be had at reasonable prices.

Plan of Pambauwang road on 2662.

Pambauwang road is 8 miles north of Tanjong Rangasa, and in the eastern monsoon there is well-sheltered anchorage in the southern part of the bay, in 15 to 18 fathoms, soft mud. The points of the bay are high and rocky, and the reef dries off 2 cables from the south side. In the west monsoon the road is quite open and exposed.

There is considerable trade at Pambauwang, and shipbuilding is a flourishing industry. A very good footpath exists between here and Majene.

Plans of Chinrana and Binanga bays on 2662.

Binanga bay, 8 miles north of Pambauwang, has anchorage in about 20 fathoms, off the village; the reef northward of the bay dries out 3 cables, and, coming from northward, the anchorage must not be steered for until the village bears 90° true.

Chinrana bay, 2 miles further north, is easily recognised by the islet of Taimanu, on the reef off the south point of the bay; it is about 100 feet high and wooded, and the only island on this coast. The anchorage, in 16 to 18 fathoms, mud, is in the south corner of the bay, eastward of the island, which affords some protection in the west monsoon; the north point of the island should bear nothing north of 272° true. In the centre of the bay are two reefs, with a least depth of 5 fathoms.

General charts 2637, 941b, 1263, 2759a.

Chart 2637, Strait of Makassar, south part. Var. 2° 30' E.

Coast.—Tanjong Onkona (*Lat. 118° 47' E., Long. 3° 5' S.*) is the low extreme of a high and well-defined peninsula, and is covered with trees which stand in the water at high tide. In the little bay east of Tanjong Onkona there is anchorage in 17 to 20 fathoms, sand, off the village of Lombone, 2 cables from shore.

Tanjong Kait (Kai), the north point of Libani bay, is 13 miles north of Tanjong Okona, with a reef drying off a mile to the southward, and very steep.

About the middle of the east side of Libani bay, the shallow Sungi Malunda empties through a shoal flat; about a mile north of Malunda, there is anchorage in 12 to 15 fathoms, sand, close to a high rock covered with vegetation.

Plan of Tapalang and Kait roads on 2662.

Tapalang and Kait (Kai) roads, two slight bays 4 and 2 miles east of Tanjong Kait, are exposed to all southerly winds, and in the east monsoon there is often a swell, especially in the afternoon. The anchorage off Tapalang is in 15 to 20 fathoms, sand. On Ujong Tapalang there is a remarkable group of trees, standing in the water; a reef dries out one cable.

Tanjong Kait is low and covered with mangroves; the anchorage, off the village 2 miles east, is in 20 fathoms water, a fair distance from shore.

Chart 2637, Strait of Makassar, south part.

From Tanjong Kait, 15 miles north to Tanjong Rangas, the shore is high and steep, with a narrow reef; midway between the two capes, is the small bay Udulemo, between two rocky points noticeable from seaward.

Plan of Mamuju bay on 3209.

Tanjong Rangas (Cape William) is low and clothed with bushes and mangroves, but rises to high land within; the reef is 2 cables broad. Strong tide races and overfalls have been reported in this neighbourhood.

LIGHT.—A *white flashing light every five seconds* is exhibited, at an elevation of 269 feet above high water, from a white iron framework, 69 feet high, situated on Tanjong Rangas. The duration of the flash is *four-tenths of a second*. It is visible from a distance of 21 miles. For the arcs of visibility, *see* Light list and charts.

Mamuju bay, immediately east of Tanjong Rangas, is divided into two parts by the island Mamuju, high and thickly wooded, but not easily seen from seaward; the passage between the south point of the island and the shore is not to be recommended for large vessels, and

General charts 2637, 941b, 1263, 2759a.

Plan of Mamuju bay on 3209. Var. 2° 30' E.

from the north end the reef dries off half a mile. Several villages line the southern shore of the bay, Mamuju (*Lat. 2° 41' S., Long. 118° 53' E.*), which contains the Rajah's house, being the largest; the Sungi Mamuju, where boats can obtain fresh water, discharges east of this village, and a pier, with 3 feet least water at the head, is on the western side of the village.

Bone Tenga, a large drying reef, southward of Mamuju, has a beacon with a white ball on its north-eastern extreme; a similar beacon marks the reef southward of it. A shoal of $2\frac{1}{4}$ fathoms lies $3\frac{2}{10}$ cables, 16° true, from the Rajah's house.

Directions.—On the western side the anchorage is in 10 fathoms, sand and mud, with the Rajah's house bearing 102° true, and the extremes of Mamuju island 24° true and 354° true. The water in the approach is very deep. There is also anchorage about 2 cables northward of the river mouth.

Approaching the anchorage north of the river mouth from westward, large vessels should pass northward of Mamuju, and then steer 192° true on a remarkable mountain crest, which will lead about a cable eastward of the beacon on Bone Tenga. When a flat hill top comes in line with the beacon on the three-quarters of a fathom reef, course may be steered for the anchorage.

For small vessels taking the passage southward of Mamuju, course 86° true on Tanjong Kasiba, with that point just northward of a conspicuous hill-top, leads with a least depth of 5 fathoms about 50 yards northward of the patch of $2\frac{1}{4}$ fathoms, and southward of the reef of three-quarters of a fathom. When the small tree on Bone Tenga is almost in line with the beacon on the latter reef, course may be steered more to the northward to pass the beacon at about a cable distant. This passage is narrow, and there is sometimes a strong current.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Mamuju every month from Makassar to Menado, both ways.

Charts 2637, 2636, Strait of Makassar.

The coast from Tanjong Rangas northward continues bold and high as far as Beling Beling bay in about lat. 2° 28' S.; beyond this to Pasang Kayu bay the mountains recede, leaving a belt of level land with scattered hills. Northward of Pasang Kayu the coast hills again merge into the higher ranges, becoming loftier and narrower towards Palos bay; with the exception of Mount Loli, 6,710 feet high, over the head of Palos bay, none of the summits are sufficiently distinctive to be of service in navigation. Between Tanjong Rangas

General charts 2637, 941b, 1263, 2759a.

Charts 2637, 2636, Strait of Makassar. Var. 2° 30' E.

and Palos bay the 100-fathoms line is from one to 3 miles off, and there are many dangers marked within it.

The population, towards the north part of Celebes, becomes denser and more mixed; their reputation in some parts is bad, and it seems advisable to regard them with suspicion.

Chart 2637, Strait of Makassar, south part.

Bone Saio, a coral reef drying at low water, with a sandbank on the south end always seen, lies 7 miles north-eastward of Mamuju island and 2 miles from land.

Coast.—Beling Beling bay is 15 miles from Mamuju island, and north-eastward of the low but timbered Tanjong Kaluku. In the depth of the bay is the high, thickly-wooded island Topisee, with confined but sheltered anchorage one-third of a mile inside it; in the bay, however, there are many detached reefs, and it should not be used without a reliable chart.

Off Buding Buding, 38 miles north of Mamuju, there is anchorage in 14 fathoms southward of the entrance to the river, with two conspicuous tall trees standing in the water bearing 78° true.

Tanjong Lalereh, 5 miles north of Buding Buding, is low and covered with trees standing in the water; the 100-fathoms line is about half a mile from the coast here. From this point the coast turns to the north-eastward to the high, thickly-wooded island Tobintah; there is anchorage in 14 fathoms, mud, westward of the island. Between Tobintah and Tanjong Dapurang, 9 miles to the northward, are numerous isolated coral reefs.

Tanjong Chenoki (*Lat. 1° 41' S., Long. 119° 17' E.*) rises steeply up to a round hill covered with trees; the reef here projects nearly a mile westward.

Two miles north of Tanjong Chenoki there is anchorage in the mouth of the Sungi Doda, sheltered by three small brushwood-covered islands, and a reef, which extends from the south side; the north point of this reef is marked by a beacon.

About 15 miles northward of Chenoki, and one mile off-shore, there is anchorage in 5 fathoms with the mouth of the Sungi Lariang 47° true. A reef, which dries at low water, lies 2 miles, 252° true, from the mouth of this river.

Tanjong Pasang Kayu is pointed and low, and may be distinguished by a very tall tree; the coast reef dries out 4 cables north-west.

Plan of Pasang Kayu bay on 3209.

Pasang Kayu bay is 3 miles wide between Tanjongs Pasang Kayu and Baku; in the depth of the bay is the small Sungi Pasang Kayu, with the large village Kaluku at the entrance, and a bank of sand and stones dries off half a mile. Water may be procured from the

General charts 2636, 941b, 1263, 2759a.

Plan of Pasang Kayu bay on 3209. Var. 2° 30' E.

river. In the centre of the bay there is a reef of sand and stones, half a mile long, north-westward of the river's mouth, the outer edge being on the line joining the two points of the bay, with other shoals to north and eastward.

The anchorage, which only gives shelter from easterly winds, is off the village Chenapu, on the middle of the south shore, in 10 fathoms, 2 cables from the beach, with Tanjong Pasang Kayu 276° true, and Tanjong Baku 42° true. The bay should be entered with Chenapu bearing 148° true.

Communication.—Vessels of the Royal Dutch Packet Company call at Pasang Kayu bay every fortnight, from Dongala to Makassar.

Chart 2636, Strait of Makassar, north part.

Coast.—From Pasang Kayu to Palos bay is 40 miles in a north-north-easterly direction. Tanjong Karang, the west point of Palos bay, has a small hill, 339 feet high, on the outer side; 6 miles south-westward is Tanjong Towali. Off this coast with Tanjong Towali 116° true, distant 1½ miles, there is a large oval-shaped coral reef, with two dry sandbanks; 1½ miles, 47° true, from this bank is a detached reef, with 2½ fathoms water. There is a safe passage inside these dangers by bringing the extreme of Tanjong Karang to bear 49° true. An anchor may also be dropped between Tanjong Towali and the reef in 10 fathoms, sand and stones. (*See view on chart 2636.*)

Plan of Palos bay on 3209.

LIGHT (Lat. 0° 38' S., Long. 119° 44' E.).—A white group flashing light every ten seconds, showing two flashes of four-tenths of a second each; eclipse between flashes two and one-tenth seconds, between groups seven and one-tenth seconds, is exhibited from a white iron framework, 69 feet high, situated on Tanjong Karang. The light is 269 feet above high water, and is visible from a distance of 23 miles.

PALOS BAY penetrates 17 miles in a south-south-easterly direction, and is 3 to 4 miles in breadth; the water is very deep, and there is anchorage only in the slightly indented bays on either side, and off the town of Palos at the head. The western side runs steeply up from the sea, the hills, which are near the coast, increase in height from the little summit on Tanjong Karang to Mount Loli, 5 miles west of Palos. On the east side there is a hilly belt of land about 3 miles wide, which merges into the mountain ranges beyond, rising to 6,000 or 7,000 feet high. At the head of the bay a slowly rising plain, with rice fields, stretches far into the interior.

Plan of Dongala road on 3209.

Dongala road, a mile south of Tanjong Karang, is the principal port in Palos bay, and the centre of trade for the surrounding country;

General charts 2636, 2660b, 941b, 1263, 2759a.

Plan of Dongala road on 3209. Var. 2° 30' E.

an Assistant Resident and Contrôleur are stationed here. The population is about 600, nearly all of whom are Mohammedans. There is fair anchorage, but only for a small number of vessels, and the water is deep. On either side of the centre of the village, the reef juts out in two points, marked by beacons 4 cables apart; the northern has a white ball topmark, the southern is surmounted by a black truncated cone.

Lights.—A *fixed red* light is exhibited from each of the two beacons, and a similar light from the Custom's flagstaff.

Anchorage.—The best anchorage is midway between these beacons, in 17 fathoms, mud, 2 cables off-shore, with the Custom-house flagstaff in line with the beacon with triangular topmark by the Contrôleur's house (which stands on a hill about a quarter of a mile from the shore), bearing 238° true.

Other but less desirable anchorage is in 24 fathoms, with the centre of the village bearing from 204° to 261° true; the bank here is very steep. Water, from the stream south-east of the Customs flagstaff, must be obtained from above the village.

Communication.—Vessels of the Royal Dutch Packet Company call at Dongala frequently. Those on the East Borneo route from Singapore and Surabaya call every fortnight; from Singapore and Bataria on the Celebes, Gulf of Tomini route, every four weeks; every four weeks from Makassar to Menado, calling both ways; and every fortnight from Makassar.

There is telephonic communication with the lighthouse on Tanjong Karang.

Plan of Palos bay on 3209

Tanjong Kabunga is a high point $2\frac{1}{2}$ miles south of Dongala, forming the north point of a bay filled by reefs, with two small vegetated islands on the outer part; on the south side of these islands is a natural basin in the coral reef, 330 yards across, with 8 fathoms water, reached by a narrow channel with 9 fathoms, which is generally marked by bamboo stakes. For a small vessel this basin gives the best shelter in Palos bay; the entrance to the channel is found by approaching with the village, two houses only of which are visible, in line with the south point of the bay. Just westward of the village is a small stream, where good water can be obtained.

Plan of Palos road on 3209.

Palos road is at the head of Palos bay, with the large village of Palos (*Lat. 0° 53' S., Long. 119° 51' E.*), at the river mouth. A bank of mud and sand dries out 2 cables, and the channel into the river has a depth of 2 feet at low water. Shoal water extends about 6 cables off-shore westward of the village. Vessels can only lie quietly in the

General charts 2636, 2660b, 941b, 1263, 2759a.

Plan of Palos road on 3209. Var. 2° 30' E.

road at night; in the day time the sea breeze is so strong that steam must be kept up, and communication with the shore is broken. The best anchorage is in about 40 fathoms, $3\frac{3}{4}$ cables to the north-eastward of the river mouth. There is also anchorage west of the river mouth in about 17 fathoms, with the Customs office bearing 160° true, but the holding is not so good, and there is more sea than further eastward.

Plan of Membora road on 3209.

Membora road (Lat. 0° 47' S., Long. 119° 52' E.), on the east side of the bay 4 miles north of Palos, is fairly sheltered from wind and sea, which frequently come into the bay. The anchorage is 2 cables from shore, in 15 fathoms, mud and sand, with the centre of the village 20° true.

Plan of Palos bay on 3209.

Panteluan road and Wani bay, 6 and 7 miles north of Membora, also give some shelter from northerly winds. At Panteluan a vessel may anchor in 20 fathoms with the east side of the village bearing 2° true.

Plan of Wani bay on 3209.

In Wani bay the water is deep, but, if necessary, a large vessel could anchor in 45 fathoms, with the flagstaff 2° true, and secure by sternfast to the shore. Fresh water can be had from the stream.

Exports from Palos bay are copra, fowls, hides, horns, horses, oxen, rattan, and sago. Imports being gambier, hardware, and manufactured goods, petroleum, rice, and salt.

Plan of Palos bay on 3209.

Tides are diurnal and semi-diurnal, the latter being most pronounced. Springs of the diurnal, or single day, tide occur about $1\frac{1}{2}$ days after the moon's greatest declination; early in January, about VIh. p.m., April at mid-day, July at VIh. a.m., and in October about midnight, with a range of 3 feet in June and December, and one foot in March and September. Neaps are observed about the time of the moon crossing the equator, ranging one foot in June and December, and with scarcely any movement in March and September.

The double day, or semi-diurnal, tide has springs two days after full and change of the moon, at about VIIh., with range of $6\frac{1}{2}$ feet in March and September, and $5\frac{1}{2}$ feet in June and December. Neaps range one foot in June and December, and in March and September it is hardly perceptible.

Chart 2636, Strait of Makassar, north part.

The coast, northward of Palos bay, is high, heavily timbered, and steep-to, with rocky points and sandy beaches. Northward of lat. 0° 25' N. is some of the highest land in Celebes, the summit of

General charts 2636, 2660b, 941b, 1263, 2759a.

Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

Mount Ogoamas being 9,558 feet above the sea. Mount Sojolo (*Lat. 0° 39' N., Long. 120° 10' E.*), 8,957 feet high, 5 miles north of Ogoamas, is a remarkable conical peak, seen in clear weather as far as the coast of Borneo, and giving an excellent bearing point in the northern part of Makassar strait.

Tanjong Oti, 18 miles north of Palos bay, is low, and the shore beyond curves somewhat in; in the centre of this curve is the village Alindau, standing on a plateau, covered with light green vegetation, conspicuous from seaward.

Anchorage.—The only anchorage between Palos bay and Tanjong Boh is in the above-mentioned bight, off the village Alindau, in 30 to 40 fathoms. Northward of Tanjong Boh the coast becomes sandy and less steep, and to Tompe, a Buginese village on the stream of the same name, where fresh water can be obtained, there is anchorage everywhere; in westerly winds there is considerable sea and surf on this part of the coast. Immediately north of Tanjong Boh is a small bight, in which the village Tondo lies, with anchorage in 20 to 25 fathoms.

Labuan Labeia affords anchorage with northerly winds in 30 to 40 fathoms; the narrow isthmus, forming the north shore of the bay, is scarcely a mile across. Tanjong Labeia, the eastern point of the bay, is rocky, and rises to a height of 1,152 feet; from southward it can be seen from a great distance. A coral reef of 6 fathoms lies outside the 100 fathoms line, 229° true, 3½ miles, from the point; a small reef of 4 fathoms water lies half a mile, 217° true, from the same point.

Batu Mekaja, a coral reef which dries at half tide, and about one cable in diameter, lies 3 miles, 276° true, from Tanjong Labeia and about half a mile from the west point of Labuan Labeia.

Westward of Labuan Labeia extends a rocky peninsula, 12 miles long and 6 miles wide, with hills rising, towards the north-west part, to 2,198 feet high. The south shore should not be neared to less than one mile, but off Manimbaya, the west point of the peninsula, the coast reef is one cable broad, and the water deepens rapidly outside.

Baleisan bay, on the north side of the peninsula, 3 miles east of Tanjong Manimbaya, has anchorage in 30 to 28 fathoms, off the village Sewia on the south side of the bay, with Manimbaya in line with two nearer rocky points, bearing 279° true, and a conspicuous tree on Tanjong Biru, 2° true. The anchorage should be steered for with the village bearing between 122° true and 162° true; there is shelter from west and south-west winds. In the north-east corner of the bay is a creek, where small vessels find safe anchorage.

General charts 2660b, 941b, 1263, 2759a.

Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

Pasie Perombian, nearly 3 miles, 295° true, from Tanjong Manimbaya, is a coral reef about 3 cables across, which dries at half tide, is very steep-to, but often seen by discolouration; the west extreme of Tanjong Dampelas touching the east side of Pulo Pasoso, leads close westward.

Pulo Pasoso (South Watcher) (*Lat. 0° 6' N., Long. 119° 37' E.*), 354 feet high, is of coral and covered with trees; in clear weather the trees are seen 20 miles. On the south-east point there is a white sandy beach, and the encircling reef extends off one cable from the north and west sides, and far out from the south-west and south-east points. There is no fresh water, and the island is uninhabited. (View at page 422.)

A fairly good anchorage, in 25 to 30 fathoms, is found between the horns of the reef projecting from the south-west and south-east points, with some shelter from west and north winds. This anchorage is reached by steering for the sandy south-east point, bearing 2° true, and following that side of the reef which is best seen, anchoring only the distance off necessary to swing.

Tambu bay, between Tanjongs Biru and Dampelas, is 12 miles across, at the entrance, and 15 miles deep; the land around is high, behind a flat, sandy shore. Tanjong Biru, at the end of a rocky ridge, runs steeply up, and has a large tree near the end; Tanjong Dampelas is the extreme of a hilly ridge with lower land within, the water is very deep close to. Upon a coral flat, extending 8 miles in a north-westerly direction from the head of the bay, are eight rocky, wooded, and uninhabited islets, 150 to 200 feet high. The outer islet, Pulo Laut, stands alone on a detached reef mostly dry at low water, extending nearly a mile southward and eastward; two small reefs of $1\frac{1}{2}$ and $2\frac{1}{2}$ fathoms lie about a mile to the north-westward. The other seven southerly islets are separated from Pulo Laut by a channel half a mile wide, and are on a steep-to reef which dries 2 cables to half a mile beyond the islets. On the eastern side of the bay, between the villages Sibaju and Seweli, are several isolated coral reefs.

Anchorage.—There is anchorage, in 30 fathoms water, in the little bay 7 miles from Tanjong Biru, off the village Pamalulu; also in 20 to 25 fathoms, in the small bay by the village Sibaju, some 8 miles south-eastward of Tanjong Dampelas. A partly drying reef extends for 6 cables from the south point of this inlet, and 4 cables from the north point; steering for the village, 47° true, will pass between them. A reef of 2 fathoms water lies 2 miles to the southward of Sibaju and one mile off shore. From the village of Tambu,

General charts 2660b, 941b, 1263.

Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

on the east side, there is a footpath over the mountains to Kasimbar, on the east coast of the island.

Dampelas bay, northward of the point, is 6 miles deep, and 7 miles wide, between Tanjongs Parepa and Begimpuang. Eastward of Tanjong Parepa the coast is steep for a distance of about 3 miles, to a small inlet with rocky points, in which the village Sabang (*Lat. 0° 13' N., Long. 119° 53' E.*) lies; there is a footpath from the village, over a couple of low hills, to a fresh-water lake, named Rano Dampelas, with a settlement of about fifty houses built in the water. Eastward of Sabang is a broad plain, through which flow the Sungis Sioang, Silandojoh, and Melonnassa; northward of the latter river is the low, sandy Tanjong Ajuang. Between this point and Tanjong Rerang is another small bay, into which the Sungi Minalebbeh and Salo Ijung discharge; Tanjong Rerang is low, and covered with mangroves. The coast reef round the bay is narrow, and disappears at Tanjong Begimpuang.

Anchorage.—On the southern side of Dampelas bay there is good anchorage in 18 to 24 fathoms, open to northerly and north-westerly winds, before the village Sabang, about $1\frac{1}{2}$ cables from the shore, with Pulo Tuguan just open of Tanjong Begimpuang, 349° true. There is also anchorage, protected from north and north-west winds, in the small bay between Tanjongs Ajuang and Rerang, in 12 to 17 fathoms, mud, off the Salo Ijung. Half a mile westward of Tanjong Ajuang is a small coral reef of 3 fathoms water, named Taka Lobang; close north-westward of this reef, and about one mile off-shore, are two partly drying reefs, named Pasie Ajuang and Pasie Ijung. Between these reefs and the coast are 15 to 27 fathoms.

Coast.—From Tanjong Begimpuang the coast bends in somewhat to Tanjong Siraru, $6\frac{1}{2}$ miles to the northward; in this bight is a narrow strip of sand, and one mile from the coast are depths of 50 to 80 fathoms. Close northward of Tanjong Siraru, and parallel with the coast, is a ridge of coral, forming a natural breakwater; an extensive part of the land behind this is submerged at high water.

Pulo Tuguan (North Watcher) is 236 feet high, and covered with high trees; the reef dries off 2 to 3 cables. On the west side there is a ridge with 30 to 40 fathoms water; 6 cables southward is a rock with less than 6 feet water, and one mile southward and south-westward are three patches of 8 to 10 fathoms; between these and the island there is anchorage in 11 fathoms, coral bottom.

LIGHT.—From an iron framework, 66 feet high, on the summit of Pulo Tuguan, is exhibited, at a height of 302 feet, a *white flashing light every five seconds*, visible 23 miles. The duration of the flash is *four-tenths of a second*.

General charts 2660b, 941b, 1263.

Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

Pulo Maputi and Pangalassian.—Between Pulo Tuguan and the coast are Pulo Maputi, 558 feet high, and Pulo Pangalassian, of 550 feet, consisting, like Pulo Tuguan, of raised coral grown over with tall trees, and steep-to; they are uninhabited, and there is no fresh water.

The channel between Pulo Tuguan and Maputi is 4 miles broad, and clear. An irregular current of 2 to 2½ knots, makes it advisable to pass through mid-channel, and not to approach either island within a mile.

Pangalassian can only be distinguished from the mainland at a short distance; the channel between, with 3 fathoms, is narrow, with many reefs and a strong current,

Anchorage.—Southward of Pangalassian, between two rocky points, about 2 cables off, is anchorage in 20 fathoms, sand. There is also anchorage on the east side of the island in 20 to 25 fathoms, sand and shells; from westward a vessel should steer midway between Pangalassian and Maputi, until Pulo Tuguan is seen northward of Maputi, 304° true; then steer for a conspicuous little point on the mainland, and anchor when the passage south of the island opens, avoiding the reef three-quarters of a mile eastward.

Reefs.—Bangilongan, a coral reef awash at low water, lies 3½ miles 96° true from the north point of Maputi; this reef is generally marked by native fishermen with a perch beacon. From three-quarters to 2½ miles east of Pangalassian are several reefs, partly dry at low water; the irregular currents make it dangerous to approach any of these shoals.

The coast from Pangalassian runs east 8 miles, and then north a like distance to Tanjong Bau; the southern part to the village Dan-gulan is low, covered with mangroves, and swampy, the northern part is sandy. The little Salo Taipan is the most suitable place on the coast to obtain fresh water. Mount Sojolo, Pulo Tuguan, and Maputi, and a 1,500-foot high summit in the same line as these islands afford good bearing points.

Tanjong Bau is low with some brushwood upon it; 2½ miles northward of the point, close to the coast and joined to it by a low strip of sand, is a large rock named Pulo Bogoang. Pasie Bau, a reef half a mile long and 3 cables broad, which dries at low water, is one mile north-west of Tanjong Bau, with deep water close round; the east point of Pulo Taring, bearing 45° true, clears the reef.

Tanjong Bogoang (*Lat. 0° 43' N., Long. 120° 3' E.*), an out-standing point rising steeply from the sea, is conspicuous by a tree in

General charts 941b, 942a, 1263.

Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

the form of a cross or star, which can be seen from Pulo Maputi. To the eastward of the point is a small bay one mile deep.

Pulo Taring (*Lat. 0° 45' N., Long. 120° 3' E.*), of granite, and 180 feet high, rises precipitously from the sea, and is entirely grown over; on the south-east point is a small sand beach, and a detached pillar of stone. The island is connected to the main by a reef with a minimum depth of one fathom; and the outer side may be approached to 2 cables.

Pulos Seijanki are $1\frac{1}{2}$ miles 62° true from Taring, being smaller and lower than that island; they are upon a reef of coral which dries at low water.

Dampal bay, a great bight of the coast between Pulo Taring and Pulo Lingian, 18 miles apart, is full of dangerous reefs which cannot be approached by the lead, so that vessels should not pass eastward of the line joining those two islands. Tanjong Iyo, $1\frac{1}{2}$ miles eastward of Pulos Seijanki, is salient, precipitous, and about 80 feet high, with a jutting out coast reef around; it should not be neared within half a mile. There is anchorage in the little bays on either side of Tanjong Iyo, in 20 to 25 fathoms, sandy bottom.

The two outer reefs in Dampal bay are, Pasie Seranga with $1\frac{1}{2}$ fathoms water, 4 miles from shore and 8 miles south-westward of Pulo Lingian; and Pasie Siokan, awash at low water, 3 miles off, and 4 miles from Pulo Lingian.

Tanjong Jaga, the northern point of the bay, is sandy with a few isolated trees of very striking shape on the extremity, visible for a great distance from southward. Between Tanjongs Jaga and Agisolo are two small bays, separated by Tanjong Sejo. In the southern, which is greatly obstructed by reefs, is the village Ogotua, the largest settlement on this part of the coast; in the northern is the small village Semboang, and close to the coast, midway between this village and Tanjong Agisolo, is a conspicuous flat rock with a knob in the middle.

Pulo Lingian is low, with trees visible 14 miles; there is a small village on the east side, and the rocky islet Koko lies near the south point. The surrounding reef extends westward and north-westward 2 miles, and as a strong current frequently runs past, the island should not be approached within 3 miles. Between Lingian and the coast there are some small islets and rocks.

Chart 3394, Tanjong Lutuno to Dondo point.

Tanjong Agisolo (Dondo point) is the northern extremity of a peninsula 5 or 6 miles in width; the land within rises steeply to a peak, 1,526 feet high, which is seen far out to sea. From Tanjong Agisolo the coast turns to the eastward for 4 miles to Tanjong Bobanchi, with several rocky points and sandy beaches in between; at

General charts 2636, 941b, 942a, 1263.

Chart 3394, Tanjong Lutuno to Dondo point. Var. 2° 30' E.

a distance of 4 cables, 122° true, from Tanjong Bobanchi, is an overgrown rock, Pulo Taidun, surrounded by a drying reef, which extends 3 cables from the north-west point.

Pulo Sematan, about 4 miles long, and thickly wooded, has a hill in the southern part, 994 feet high, which can be seen from a considerable distance, and affords a good bearing point. The island is surrounded by a coral reef extending 2 to 3 cables, and partly drying at low water. On the east side it is steep-to, the 100-fathoms line lying about a cable from the coast reef; on the west side are four detached reefs, but the island can be safely passed at 8 cables distance here.

Reefs.—About 5 miles, 227° true, from the north-west point of Sematan, and 2 miles off-shore, is a small reef of 4½ fathoms; half a mile, 156° true, from this reef is Pasie Bambapula, of one fathom water. Both reefs are marked by discoloured water.

DONDO BAY, eastward of the peninsula, is about 12 miles deep; the western shore is very steep, but from the southern and eastern sides a flat runs off to the 100-fathoms line, one to 5 miles. The mountains on the east side of the bay are frequently obscured by clouds, but a 2,923 feet cone on the southern slope of the Toli Toli mountains is very conspicuous, and can be seen from a great distance. The highest summit of these mountains is 7,560 feet.

Pulo Tampalekang (*Lat. 1° 0' N., Long. 120° 23' E.*), half a mile to the southward of Sematan, is low, partly covered with shrubs, and inhabited; on the south point are a couple of trees, visible 10 to 11 miles. There is a safe channel either side of this islet; the southern is nearly one mile broad, with a least depth of 12 fathoms; the northern is 2 cables broad, with a least depth of 8 fathoms. The surrounding reef extends over half a mile westward, but is steep-to, and can nearly always be seen by discolouration.

Directions.—From westward, unless the reefs are clearly seen, vessels should pass northward of Pasie Bambapula and the 4½-fathoms reef north-westward, steering more to the southward for the channel between Tampalekang and Taidun when the latter is well open of Tanjong Bobanchi; owing to the strong stream that sometimes runs here it is advisable to keep in mid-channel.

For the passage northward of Tampalekang, after passing Pasie Bambapula, steer for the south-east point of Sematan on the bearing 89° true until Tampalekang is abeam, when the course is a little more to the southward. If the sharp, 2,923-feet high cone of the Toli Toli mountains is visible, it may be kept in line with the south-east

General charts 2636, 941b, 942a, 1263.

Chart 3394, Tanjong Lutuno to Dondo point. Var. 2° 30' E.

point of Sematan for entering this strait; the south coast of the island can be safely passed at a very short distance.

Telok Santigi, the small bay southward of Tanjong Bobanchi, affords sheltered anchorage in all winds for two or three vessels in 18 to 20 fathoms, 2 to 3 cables off the village at the head. The passage in is southward of Pulo Taidun, but the creek should only be entered at low water, when the reefs are seen.

From Telok Santigi the coast runs to the southward, and is too steep for anchoring; Batu Banga, nearly 4 miles from the bay, is fairly conspicuous from northward.

Telok Bananga, fully 2 miles broad and deep, is on the western side of a narrow, hilly tongue of raised coral, about 7 cables broad and terminating northward in Tanjong Senjangang (*Lat. 0° 52' N., Long. 120° 23' E.*); the west and south shores of the bay are sandy, the east is rocky. The village Stadang lies on the west side of the bay, and about one mile to the southward the Salo Bananga flows out, but the mouth is almost dry at low water. The village Luak is on the south side of the bay; a small reef awash at low water lies about 2 cables from the shore off this village.

Limbana Luak, a small creek in the south-east corner of Telok Bananga, affords sheltered anchorage at all seasons for one or two vessels, in 18 to 30 fathoms. The entrance is narrow but clear, and both sides can be passed at a short distance; the shores are lined with dense mangroves. The course in is 160° true to 171° true, on the low west entrance point, then rounding this point by sight.

Off Tanjong Senjangang there is temporary anchorage in 10 to 25 fathoms; the coast reef extends about 2 cables from the point.

Coast.—From Tanjong Senjangang the coast turns to the southward for 3 miles to the rocky Pulo Tibu, about 60 feet high and lying on the coast reef. Two miles further it bends to the eastward with the small villages Labua, Kulossi, and Bialo in the bight under a clump of cocoa-nut trees. The Salo Lais, with the village of the same name a short distance up stream, flows into the sea about 1½ miles eastward of the bight. Malomban village, near Tanjong Buntung, a conspicuous rocky point, is 3½ miles further eastward, but several detached reefs make it advisable not to approach this part of the coast. Immediately eastward is Tanjong Ogogili, off which a partly drying sandbank extends for half a mile.

Reefs.—Pasie Beluwah, a coral reef partly drying at half tide, lies 2 miles, 27° true, from Tanjong Ogogili; Pasie Lamenti, of 2½ fathoms, lies 2 miles, 245° true, from this reef.

Telok Pagalungian, in the south-east angle of Dondo bay, has somewhat the character of a fiord, the densely wooded hills on the

General charts 2636, 941b, 942a, 1263.

Chart 3394, Tanjong Lutuno to Dondo point. Var. 2° 30' E.

eastern side rising steeply out of the water; the western side is low, and covered with mangroves. Tanjong Malalang, the western entrance point, can be passed close-to, but the coast reef extends for a considerable distance from the opposite point, narrowing the channel to 2 cables, with depths of 30 fathoms; a coral reef, on which are eight small islets, surrounds the entire bay. Steering close by Tanjong Malalang, on a south-westerly course, there is secure anchorage in a basin about half a mile in diameter, in 18 to 28 fathoms, mud. Further in the depths decrease to 11 fathoms, but this part should only be entered when the reefs can be seen.

Coast.—From Telok Pagalungian the coast runs to the north-eastward for 3 miles to Pulo Luang, a 30-feet high rock lying on the coast reef; high hills covered by impenetrable forests rise steeply close to the coast. Northward of Luang is a small bay about one mile broad with a reef of $3\frac{1}{2}$ fathoms in it. Pasie Salungkan, a reef awash at low water, about 2 cables long and one cable broad, lies one mile, 338° true, from Luang; the coast otherwise is free from danger.

Salo Maraja flows out about 3 miles northward of Luang; at the mouth are 14 fathoms water, but the channel is so narrow that a steam launch has barely room to turn, and the depths rapidly decrease to one fathom. A footpath runs along the valley to the Gulf of Tomini. Tanjong Maraja, a low point covered with shrubs and mangroves, is conspicuous from the northward; eastward of the point is a hill with a square summit. From Tanjong Karanja, about $2\frac{1}{2}$ miles to the northward, the coast reef extends half a mile and entirely fills in the small bight northward; Tanjong Pangaluang (*Lat. $0^\circ 57' N.$, Long. $120^\circ 38' E.$*), the north point of the bight, is a steep spur of a mountain ridge.

Reefs.—Midway between Tanjongs Karanja and Pangaluang, and one mile off-shore, is a reef of $4\frac{1}{2}$ fathoms; one mile to the northward of the latter point is a partly drying coral reef. Pulo Latungan, open northward of Pulo Samujan, 60° true, clears the reefs north of Tanjong Pangaluang; Pulo Samujan is a high, thickly-wooded islet on the coast reef, 4 miles to the north-eastward of Tanjong Pangaluang.

Coast.—From Tanjong Pangaluang the coast trends in a general north-easterly direction for $10\frac{1}{2}$ miles to Tanjong Toli Toli, and is mountainous, densely wooded, forming islets and deep inlets enclosed by the partly-drying coast reef. The small village Balowah, $1\frac{1}{2}$ miles eastward of Pangaluang, is reached by native vessels through a gully in the coast reef that is one mile broad here.

General charts 2636, 941b, 942a, 1263.

Chart 3394, Tanjong Lutuno to Dondo point. Var. 2° 30' E.

Pulo Tingi Langa is a thickly wooded island about 2 miles long in an east and west direction; in the north-eastern part it attains a height of 709 feet, and is very conspicuous. The south-west point is joined to the main coast by the surrounding reef, but on the south-eastern side is a narrow bay, named Telok Bulias, affording shelter from all winds. At the entrance are 20 to 25 fathoms, decreasing further in to 16 fathoms; the bay extends inland with three arms, and the shores are lined by a coral reef, with narrow passages between and numerous islets on the reef. The only inhabited place in the bay is the village Bulias, on the eastern side of the entrance.

On the west side of the entrance is a small reef awash at low water, a similar reef lies nearly a mile to the north-eastward, under the coast; 7 cables northward of the east point of Tingi Langa is the eastern extreme of a large coral reef, consisting of two parts, awash at low water, with 10 fathoms between.

To enter the bay steer 212° true on the small islet southward of the east point of Tingi Langa, and thence in mid-channel by sight of the reefs to the anchorage in 16 to 18 fathoms, mud.

Pulo Kapetan is a long, narrow, thickly wooded, and thinly populated island, separated from the Celebes coast by a clear deep channel nearly 2 miles wide. A ridge of hills runs almost the entire length of the island, a small flat part in the middle only giving it the appearance of two islands; the most conspicuous summit, 571 feet high (*Lat. 1° 2' N., Long. 120° 40' E.*) is in the southerly part. From the north-east point the coast reef extends fully a mile, with Pulo Bool lying half a mile from the point.

Pulo Tumpangan, with the smaller Pulo Boloh to westward, lies on the same drying reef; between this reef and that extending from Pulo Bool is a passage 7 cables broad, with depths of 30 fathoms. Pulo Pamanukan, a conspicuous rock with a couple of bushes on it, lies on a detached reef 7 cables, 67° true, from Tumpangan; about 7 cables, 34° true, from this rock is a small coral reef of 2 fathoms.

Plan of Negri Baru bay on 2662.

Negri Baru bay (Toli Toli), which affords secure anchorage in all seasons, is about $1\frac{3}{10}$ miles broad and deep, with depths of 18 fathoms, mud and black sand; in the northern part there is coral. Within the 10-fathoms line the depths rapidly decrease, and it is advisable not to anchor in less than 16 to 18 fathoms. The shore consists of gently sloping sand, drying out about 2 cables at low water; several streams flow into the bay, but they can only be entered by boats at high water.

General charts 3394, 2636, 941b, 942a, 1263.

Plan of Negri Baru bay on 2662. Var. 2° 30' E.

Tanjong Toli Toli, the southern point, is low and clothed with mangroves, the mountains here making a wide circle inland. The village Nalu, the residence of the native prince, lies about one mile eastward of the point. The village Baru, the centre of trade for the neighbourhood, lies in the middle of the east shore of the bay, and is the station of a Dutch Civil Authority; a flagstaff (*Lat. 1° 2' N., Long. 120° 49' E.*) stands before his house, but it is not readily seen when entering. A large house with zinc roof is a very striking object.

Tanjong Labuan Dedeh, the north point of the bay, is a steep rocky point, the mountains again returning to the coast leaving a large cultivated plain round the bay. A little eastward of the point is the Customs-house and flagstaff, with a wooden pier on screw piles, 85 feet long and 42 feet broad at the head, with 5 fathoms alongside. There are no mooring posts or buoys, but hawsers can be made fast to the neighbouring trees; with strong westerly winds it is advisable to moor with head to the south-westward, and there is ample swinging room. Coolies for loading and unloading can be obtained for a moderate price.

Pulo Latungan, 522 feet high and thickly wooded, lies across the entrance; from the south point the reef projects 3 cables and one to 2 cables from the north point.

Reef.—A detached reef, partly drying at low water, lies $1\frac{3}{10}$ miles 254° true from Tanjong Toli Toli; the conspicuous house with zinc roof in line with the point, 77° true, passes clear northward.

Supplies.—Provisions are scarce. Water may be procured from the streams in the bay.

Trade is principally in the hands of Buginese and Chinese, with Makassar and Singapore. The exports are trepang, copra, and forest produce; the imports are earthenware, glass, haberdashery, linen, rice, &c.

Communication.—Vessels of the Royal Dutch Packet Company call every four weeks on the voyage from Makassar to Menado and back, visiting intermediate ports.

Tides are very similar to those at Palos bay. High water of the double-daily tides, at full and change of the moon occurs at VIh. 30m., with a range of $5\frac{1}{2}$ feet in April and October, and $4\frac{1}{2}$ feet in January and July; the greatest neap range is one foot, in January and July.

With the single-daily tides, the highest are two days after the moon's maximum declination, and occur on 1st January at VIh. p.m., 1st April at noon, 1st July at VIh. a.m., and 1st October at midnight; the range in June and December is $2\frac{1}{2}$ feet, in March and September $1\frac{1}{2}$ feet. Neaps are two days after the moon crosses the equator; the range seldom exceeds 6 inches.

General charts 3394, 2636, 941b, 942a, 1263.

Chart 339½, plan on 2662. Var. 2° 30' E.

Directions.—From Sematan channel a course may be steered for Tanjong Paligisan, the south point of Pulo Kapetan, which appears as two islands from this distance; Mounts Lakopamea and Sikala on Tanjong Besar will be clearly visible to northward. Tanjong Paligisan may be rounded at a short distance, but it must be borne in mind that the current frequently sets to the northward. The highest point of Pulo Latungan is then steered for until past the reef northward of Tingi Langa, keeping the house with zinc roof open of Tanjong Toli Toli until abreast the east point of Latungan, when the pier at Labuan Dedeh may be steered for, or the anchorage off the village Baru.

There is also a clear passage north of Latungan, taking care not to approach the north point within 2 cables.

From westward, north of Pulo Sematan, the bay may be entered by passing one mile north of Pulo Pamanukan.

Chart 339½, Tanjong Lutuno to Dondo point.

Coast.—From Tanjong Labuan Dedeh the coast trends in a general northerly direction for 17 miles to Tanjong Besar, and is high, with rocky points and shallow bays between with sandy beaches. There are no dangers inshore, but a ridge of reefs, most of which dry at low water, runs at about 5 miles distance, with depths of 25 to 50 fathoms between them and the coast.

Tanjong Kekoh (*Lat. 1° 7' N., Long. 120° 47' E.*) is a rocky point 3½ miles northward of Tanjong Labuan Dedeh; on the point is a hill 561 feet high, with a remarkable round tree on the summit, seen westward as far as Pulo Sematan. A detached coral reef of 3 fathoms lies close to the coast 1½ miles northward of the point, and one mile further northward is a rock above water on the coast reef.

Pulo Tende is 175 feet high, with three hills; the western is of light green colour, and shows well against the dark background. The island is joined to the point on the main coast by a partly-drying reef.

Anchorage. — Between Pulo Tende and Tanjong Kambol, 3 miles north-eastward, is a bay about 3 miles wide and 2 miles deep, which affords good anchorage near the shore; in the southern part a steep mudbank extends half a mile. Northward of Tanjong Kambol the coast is sandy, with a few small settlements, Kalumpang, on the stream of the same name, being the largest.

Telok Kapas, 2 miles southward of Tanjong Besar, affords well-sheltered anchorage in 15 to 17 fathoms, sand. In the southern part is the village Kapas, which drives a small trade in copra, trepang, &c.; northward of the village the coast is flat and clothed with mangroves, the coast reef projects 3 to 4 cables.

Pulo Kapas, near the south point of the bay, is highest on the west side and heavily timbered; the east point is low, with a few houses.

General charts 2636, 941b, 942a, 1263.

Chart 3394, Tanjong Lutuno to Dondo point. Var. 2° 30' E.

The surrounding reef projects 3 to 4 cables on the north and south sides, with reefs of 3 fathoms immediately outside.

Between Pulo Kapas and the coast there is a narrow passage, which can easily be navigated when the reefs are clearly seen. The eastern shore should be held with a northerly course in depths of 12 fathoms, decreasing to 8 and 9 fathoms off the east point of the island. When the small stream that flows out in the middle of Kapas village bears 115° true, the reef extending from the southern point of the bay may be rounded for the anchorage.

Tanjong Besar (Stroomenkaap) (*Lat. 1° 20' N., Long. 120° 49' E.*), the north-west point of Celebes, is a remarkable rocky bluff bordered by a coral ledge about 2 cables wide. On the end of the ridge forming the cape is a small wood, which appears as an island when first seen; within this are Mount Lakopamea, 1,545 feet high, and, more to the southward, Sikala, of 1,870 feet. These hills are very conspicuous, and seen from northward both have pointed summits. (*See view on chart 2636.*)

Pasie Salanro, a coral reef half a mile in breadth, and extending southward $3\frac{1}{2}$ miles, lies one mile to the westward of Tanjong Besar; many parts of it show at half tide, and at low water springs it is almost entirely dry. On the north end of the reef are the two Salanro islands; the western is 80 feet high, bare, and visible 11 to 12 miles; the eastern and larger, 140 feet high, has some vegetation, and may be seen 14 miles. Between the islands are rocks always above water.

LIGHT.—A *white group flashing* light, showing a group of *three* short flashes *every ten seconds*, is exhibited from a lighthouse on the eastern Salanro island, and should be seen from a distance of 18 miles.

Kapas strait, between Pasie Salanro and the main coast, is a safe, navigable passage, with a least breadth of half a mile, and depths varying from 30 fathoms in the southern entrance, to 11 fathoms in the northern.

Entering from southward the course through the strait is 6° true, keeping rather on the reef side, and Salanro islands must be well in line before rounding the cape. A current of one to 2 miles an hour sometimes runs through the strait, and outside the northern entrance is frequently a short and turbulent sea.

Dangers between Pulo Kapetan and Tanjong Besar.—Pasie Lolah lies 2 miles to the northward of Pamanukan, partly dries at low water, and can generally be seen by discolouration. Pasie Bulu Mata, of 7 fathoms, lies near the edge of the 100-fathoms line, 4 miles to the northward of the highest part of Kapetan.

Pasie Dalanang, a reef drying at half tide, lies $6\frac{1}{2}$ miles, 276° true, from Pulo Tende.

General charts 2636, 941b, 942a, 1263.

Chart 3394, Tanjong Lutuno to Dondo point. Var. 2° 30' E.

Pasie Batang, of $3\frac{1}{2}$ fathoms, lies 4 miles, 275° true, from Pulo Tendeh, and is not easily seen; Pasie Sinoat, of 6 fathoms, lies $2\frac{1}{2}$ miles to the north-eastward of this reef.

Pasie Besar is a cluster of reefs, partly dry at low water, 2 miles long and $1\frac{1}{2}$ miles broad; the outer edge is about 6 miles south-westward of Pulo Kapas, and is very steep. Eastward of the north point is a reef of 3 fathoms, named Pasie Kambala; Pasie Selumpis, of 7 fathoms, lies a mile further eastward.

For north coast of Celebes, *see* pages 533-555.

Chart 2636, Strait of Makassar, north part.

EAST COAST OF BORNEO, from Tanjong Mangkalihat (*see* page 378), 90 miles to Sungi Berau, is low and overgrown with mangroves, except south-east of Telok Seliman, and near Tanjong Domaring, where it is rocky. Along the coast from Seliman there is a reef of dead coral overlaid with mud; about the island Buaja Buaja, however, the coral is living, and at Sungi Berau only mud is found. Northward of the Kaniungan islands is an extensive triangular coral formation of irregular depths, terminating eastward in Bilangbilangan: the principal reefs are marked by beacons, but navigation is difficult here on account of the absence of conspicuous landmarks, and discoloured water gives no indication of less depths.

Mountains.—The Kaniungan mountains consist of two summits close together, the highest is 2,559 feet high, and conical. Southward of Buaja Buaja are two hills 1,230 and 1,181 feet high. Mount Briun has two summits, each 2,953 feet high, and projects well above the surrounding hills; 25 miles to the east-south-eastward is a 2,264-foot high mountain. Northward of Mount Briun are the Limestone mountains, a long ridge running parallel to the coast, the north-western part attaining a height of 3,642 feet: in front of this range, near Tanjong Domaring, is a line of hills, the most noticeable being Babagunung, 591 feet; Baju, 787 feet; and Taballar, 591 feet high. Northward of the Limestone mountains is a range not far from the coast, the most conspicuous being the Sugarloaf, 1,722 feet high. Suwaran (*Lat. $1^\circ 45' N.$, Long. $117^\circ 55' E.$*), about 20 miles inland, is a broad-topped mountain of peculiar shape rising to a height of 4,036 feet. Close to the coast, by the Muara Pantai, is Samiroa, 345 feet high, standing alone, and of a regular dome shape; close southward is Padai, a sharp summit 1,132 feet high, which in clear weather can be seen from the neighbourhood of the Malalungun reef. Simrut is a very conspicuous 689-foot high hill, eastward of the Sugarloaf, and about 2 miles from the coast. (View at this page.)

Winds and weather.—On this portion of the Borneo coast, regular monsoons, as well as land and sea breezes are less distinctly marked than in other parts. From July to October southerly winds prevail, from December to May, northerly winds. In July, the

General charts 941b, 2660b, 1263.

Baleian.



Celebes, west coast; Pulo Pasoso.

Baja. *Taballar.* 1,624 ft. 1,722 ft. *Brian.*

(a)

Babagunung.

Limestone mountains.

3,642 ft.



(b)

Suearan. *Simud.* *Njapa mountains.* *Inaran mountains.* 2,608 ft. *Padai.* *Sugarloaf.*

(c)

Padai.

Muara Pandai.

(d)

Samiroa, bearing 281° true, 8 $\frac{3}{10}$ m.

Borneo, north-east coast; from the Muara Pandai;

Chart 2636, Strait of Makassar, north part. Var. $2^{\circ} 30'$ E.

average direction of the wind in the daytime is S.S.E., in August S.E., and in September S.S.W.; at nights, during these three months, the average direction is S.S.W.

In October and November, also in May and June, are slight variable winds, with frequent calms.

The north monsoon is considered the wet season, the south monsoon, the dry season, although rains are abundant at all times, and sudden squalls frequent. Cloudiness is more marked by day; the nights are cool.

Plan of Kaniungan islands on 3031.

Coast.—By Tanjong Mangkalihat the coast is covered with mangroves, further westward it becomes rocky: Batu Belobang, a conspicuous rock with a gap in it, lies close to the coast at the commencement of the rocky part. In clear weather Mount Sojolo, in Celebes, can frequently be seen from here.

Telok Sumbang, $8\frac{1}{2}$ miles from Tanjong Mangkalihat, is 2 miles deep, with anchorage at the head, off a small rivulet with a few houses at the mouth: the water outside the reef is very deep, and the 100-fathoms line is nowhere more than half a mile from shore. Mount Antu, 2,313 feet high, on the east side of the bay, is conspicuous from northward.

Telok Seliman, 6 miles north-westward of Sumbang, and immediately north of two high narrow islands close to the shore, is narrow, and runs deeply into the land, but there is sheltered anchorage, in 6 to 9 fathoms, mud. The reefs on either side jut far out, but there is a contracted entrance with $5\frac{1}{2}$ fathoms, and a deep hole of 25 fathoms just inside: the bay should only be entered at low water when the rocks are seen.

Buoys and beacons.—The entrance to Telok Seliman is marked on the north side by a white conical buoy, and in the south side by a black can buoy. Beacons surmounted by balls and cones mark the channel higher up.

Kaniungan islands are two coral islands on the south-east side of an extensive bank of 20 fathoms water and under. Kaniungan besar (*Lat. $1^{\circ} 7' N.$, Long. $118^{\circ} 51' E.$*), the southernmost, is half a mile across, and wooded, the tree tops being 236 feet above water, and visible 17 miles in clear weather; the reef dries eastward one mile, and northward and westward half a mile, but on the south side is very narrow, and drops steeply into the deep gully towards the land, where 150 fathoms may be found. Kaniungan kecil, 3 miles north-east of besar, is small and low, with some pandanus trees; the drying reef is about a mile across on the north and east sides.

Anchorage.—There is fair anchorage on the south-west side of Kaniungan kecil, in 7 fathoms, sand, with some shelter from north-east wind and sea.

General charts 2636, 941b, 2660b, 1263.

Plan of Kaniungan islands on 3031. Var. 2° 30' E.

Reefs.—A coral reef of $3\frac{1}{2}$ fathoms water and $1\frac{1}{2}$ cables diameter, lies $1\frac{3}{10}$ miles, 312° true, from the south-west point of Kaniungan besar. Karang Paninsinan, 3 miles north-westward of Kaniungan besar, is $2\frac{1}{2}$ miles long in a north and south direction, with several patches of less than 3 fathoms on it, and a rock awash at low water on the southern part; a reef of $4\frac{1}{2}$ fathoms lies nearly a mile to northward. Karang Menungulan consists of three shoals of less than 3 fathoms lying about 4 miles to the north-westward of Kaniungan kechil; 2 miles to the northward are two patches of 4 and $4\frac{3}{4}$ fathoms. Nearly 3 miles to the north-westward of Kaniungan kechil is a reef of $3\frac{1}{2}$ fathoms.

Between the Kaniungan islands is a safe passage with a least depth of $4\frac{3}{4}$ fathoms.

Coast.—From Telok Seliman the coast runs to the northward for 2 miles, forming Tanjong Giring Giring, a low point conspicuous from the north, then turns to the north-westward for 16 miles; this part of the coast is low, swampy, and inaccessible, and the coast reef broadens out to 2 miles. About 6 miles from Tanjong Giring Giring is a small creek named Labuan Klambu, but it can only be entered at high water by native boats; a reef of one fathom water lies $1\frac{1}{2}$ miles to the north-eastward.

Plan of Buaja and Manimbora anchorages on 3031.

Buaja and Manimbora anchorages.—Manimbora island (Lat. $1^\circ 28' S.$, Long. $118^\circ 32' E.$), is of coral, with cocoanut trees, which in clear weather are visible 10 miles; there is no fresh water, and the island is used as a burial ground. It is surrounded by a coral reef, except on the south-west point extending for $1\frac{1}{2}$ miles in an east-south-easterly direction. There is a passage on the north side, but that to southward is blocked by reefs.

The anchorage of Buaja is nearly a mile west of the north point of Tanjong Buaja Buaja, in 10 or 12 fathoms, and can only be safely reached when the reef edges are seen; some small beacons erected by local inhabitants are not to be depended on. The little village on the north-west point of Buaja Buaja is built on piles, the houses being connected by foot bridges. Mangroves grow out upon the reef, so that the limits of the island are not easily defined; on the north-east side it dries off $2\frac{1}{2}$ miles. There is a large tree in the middle of the island. The narrow channel southward of the island is obstructed by shoals.

Ulaban, a small islet on the coast, $4\frac{1}{4}$ miles south of Manimbora, has a few native huts on a white sand beach, and a grove of cocoanut trees. Two rocks of $3\frac{3}{4}$ fathoms lie 5 and 6 miles to the eastward of Ulaban.

General charts 2636, 941b, 2660b, 1263.

Plan of Buaja and Manimbora anchorages on 3031. Var. 2° 30' E.

Tides.—At Tanjong Buaja Buaja, from March to July inclusive, both double and single daily tides were observed; the greater range of the former was 9 to 10 feet, and the lesser 2 to 4 feet; single tides ranged only 3 feet, and one foot. Tidal streams were weak.

Coast.—Between Tanjongs Kalindakkan and Samuntai the coast is low and swampy, a large portion covering at high water. Midway between these points is the village Batu Putih on the stream of the same name; a footpath leads from here to Sangkulirang bay. From Tanjong Samuntai the coast turns to the north-westward to Tanjong Domaring, a high rocky point formed by a spur of the coast hills. Beyond this the same low land continues to the Sungai Berau.

Plan of Kanuingan islands on 3031.

Off-lying islands and reefs.—**Taka Sangalan**, a reef of less than 5 fathoms, about 3 miles long and nearly one mile broad, in a north-west direction; a small part at the south-east end dries at springs. From here Balik Kukup and Mataha can just be seen in fine weather from an elevation of 20 feet.

Beacon (*Lat. 1° 19' N., Long. 118° 46' E.*).—An iron beacon, surmounted by a white ball, is erected on the drying part of Taka Sangalan.

Plan of Buaja and Manimbora anchorages on 3031.

Taka Linchang, a chain of reefs 3 miles long, with deep water between; the least depth of $2\frac{3}{4}$ fathoms is 8 miles to the north-westward of the dry part of Taka Sangalan. There is a depth of 3 fathoms $2\frac{1}{2}$ miles, 342 true, from this shoal, and $2\frac{1}{2}$ fathoms nearly half-way to Taka Sangalan.

Chart 2636, Strait of Makassar, north part.

Karang besar, forming the north side of the inner channel, from Manimbora island westward, is about 20 miles in length, east and west, and some 10 miles in breadth. The reef is mostly dry at low water, and many parts at half tide.

Beacon.—A screw pile beacon, with white ball, is on the northerly edge of Karang besar. About 2 miles to the north-eastward of this beacon are some isolated patches of 4 to 5 fathoms.

Plan of Buaja and Manimbora anchorages on 3031.

Balik Kukup is a small islet, with trees visible 14 miles, on the south-east part of Karang besar reef; a small quantity of fresh water may be obtained here. The reef extends a mile eastward of the island.

Beacon.—A screw pile beacon, with white ball, is on the edge of the reef about one mile east-north-east of Balik Kukup.

General charts 2636, 941b, 2660b, 1263.

Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

Karang Dugalahan, 10 miles eastward of Balik Kukup, dries at low water; 2 miles to the southward is a depth of $2\frac{3}{4}$ fathoms.

Mataha and Bilangbilangan, two uninhabited coral islets, with trees visible 13 and 14 miles, standing on the end of a narrow ridge, with 4 to 10 fathoms, which extends from Karang besar, 15 miles eastward to Mataha, and 5 miles further north-east to Bilangbilangan. The islands are 4 miles apart, and the ridge projects 2 miles beyond to north-eastward, being very steep on the west side. There are some shallow spots within a mile of the islands on the east side.

Between Mataha and Karang Dugalahan, there is a passage with 5 to 9 fathoms; and about the same depths between Mataha and Bilangbilangan.

Current.—Outside the reef parallel to the shore, there is a constant current to the south-eastward of about one mile an hour, occasionally amounting to $2\frac{1}{2}$ miles.

Malalungun, 14 miles to the northward of Karang besar, is triangular, the sides being each about 3 miles long. The reef partly dries at low water, and except on the south side, is steep-to.

Muaras reef, 11 miles northward of Bilangbilangan, is 18 miles in length, 3 to 5 miles wide, partly dries, and, except at the south end, steep-to on all sides, with over 100 fathoms at a short distance. At the south-east end are the islets Sambit and Balembangan; Sambit, the eastern, is a sandbank grown over with low trees; Balembangan is higher, and may be seen 11 miles. Gosungan, near the north end of the reef, is a dry sandbank. There is anchorage south of the islets Sambit and Balembangan.

LIGHT (*Lat. 1° 46' N., Long. 119° 2' E.*).—A white flashing light every ten seconds, thus:—flash, three seconds; eclipse, seven seconds, visible from a distance of 15 miles, is exhibited, at 105 feet above high water, from a lighthouse on Sambit islet.

Chart 2636, Strait of Makassar and plans on 3031.

DIRECTIONS. — From Tanjong Mangkalihat to any of the places on the coast southward of Sungi besar there are three routes as far as Manimbora, as follows:

In the passage eastward of the Kaniungan islands course may be shaped from Tanjong Mangkalihat to pass one mile eastward of Kaniungan kechil, then course 320° true to pass westward of the beacon on Taka Sangalan. This beacon must serve as a guiding mark until Manimbora, which is visible 10 miles, can be steered for, bearing in mind the reef of $2\frac{1}{2}$ fathoms 4 miles 306° true from the beacon, the

General charts 2636, 941b, 2660b, 1263.

Chart 2636, Strait of Makassar, and plans on 3031. Var. 2° 30' E.
two rocks of 3½ fathoms, 5 and 6 miles eastward of Ulaban, and Taka Linchang.

In the passage between the Kaniungan islands, steer 317° true from Tanjong Mangkalihat to pass between these islands and also between Karang Paninsinan and Karang Menungulan. When Kaniungan besar bears 143° true, keep it astern with course 323° true, to pass eastward of the one-fathom rock 1½ miles north-eastward of Labuan Klambu. Kaniungan besar generally disappears from sight here, and the depths will be 15 to 19 fathoms; when soundings of 10 fathoms are obtained alter course about 5° more to the westward until Manimbora is sighted and steer for it on the bearing 312° true.

The third route is the inshore passage west of the Kaniungan islands. From Batu Belobang (*Lat. 1° 3' N., Long. 118° 57' E.*) steer for the centre of the passage between Kaniungan besar and the high west point of Telok Sumbang. When the west point of the island is in line with Batu Belobang, 117° true, a northerly course may be steered until Kaniungan besar bears 143° true, proceeding then as described above.

Plan of Buja and Manimbora anchorages on 3031.

Having crossed the line joining Ulaban and Balik Kukup steer to pass 6 cables northward of Manimbora with a 296° true course, which leads about one cable southward of a reef of 3 fathoms. When the drying reef extending from Manimbora has been passed the course is 283° true, until that island bears 117° true; keeping this astern with course 301° true leads through the channel into the open water. From westward very great caution is necessary in approaching. This channel is only safe in fine weather, and when the reefs can be seen; if one side is more clearly visible than the other then that edge should be followed.

Chart 2636, Strait of Makassar, north part.

From Tanjong Mangkalihat to Sungi Berau.—From Tanjong Mangkalihat steer eastward of Kaniungan kechil, which can be passed at about one mile distance, and then shape course to pass about 2 miles eastward of Balik Kukup; this will lead eastward of Taka Sangalan and Taka Linchang. When clear of the detached shoals north-eastward of the northern beacon on Karang besar, the course is to the north-westward until Mount Padai (*Lat. 1° 58' S., Long. 117° 47' E.*) can be steered for on the bearing 276° true.

At night or in thick weather, the safest route is outside Mataha and Bilangbilangan, these islands not being approached nearer than 2 miles. If the weather be sufficiently clear a course may be taken over the ridge, one mile westward of Mataha, in 6 to 8 fathoms.

Islands and dangers eastward of Sungi Berau.—**Pulo Maratua** is in the shape of a letter V with the open part to

General charts 2636, 941b, 2660b, 1263.

Chart 2636, Strait of Makassar, north part. Var. $2^{\circ} 30' E$.

the south-east; it consists of thrown-up coral, and is the raised portion of an atoll reef 16 miles in length and 5 miles in breadth. The highest part, 394 feet, is at about the middle of the west side, and in clear weather may be seen 20 miles.

Off Tanjong Bahaba, the south-east point of Maratua, are some ten islets; and on the extreme south point of the reef are many loose stones and three islets, named Bakungan, Bakungan Kechil, and Nunukan; the first named is grown over with small wood, visible 10 miles. The whole reef is steep-to, and in many places broken through by the sea; the prevailing south-easterly current here sets across, and near the south point there is a strong counter current to the northward. The islands have no permanent population, but are visited in the season by native boats, in search of birds' nests, camphor, ebony, rattan, and trepang.

Water is obtained from a well on the west side of Maratua, about 2 miles from the north point; probably it may also be found in other parts by digging.

Anchorage.—Southward of Tanjong Bahaba there is a passage through, about 87 yards broad, which with local knowledge and good sight of the reefs, may be entered by vessels 170 feet long. The course through is 204° true, along the west side of the largest islet, in 12 to 9 fathoms; off Tanjong Bahaba the channel turns west and the depth decreases to 4 fathoms, afterwards becoming broader and deeper, with sheltered anchorage in 6 to 7 fathoms. Strong tidal streams are felt, particularly at springs, and at the entrance a short sea is caused by the south-east current.

Pulo Kakaban, 4 miles south-westward of Maratua, is 295 feet high, uninhabited, and from outside appears flat and heavily timbered; within a rock wall, however, which in some places is only 160 yards broad, is a lagoon where the water rises and falls with the sea outside. The surrounding rim of coral is equally raised all round, and being much underworn by the waves, is exceedingly difficult to climb. The coast reef does not exceed half a cable in width, and is steep-to. There is no fresh water.

The prevailing south-easterly current will sometimes run past at the rate of $2\frac{1}{2}$ miles an hour.

Sangalakki (*Lat. $2^{\circ} 5' N.$, Long. $118^{\circ} 23' E.$*), a small coral islet 7 miles south-westward of Kakaban, is covered with trees visible 14 miles; it is surrounded by a reef, varying in width from a half to $1\frac{1}{2}$ cables on the west side, where there is anchorage in 16 to 20 fathoms, and extending about half a mile on the other side.

General charts 2660b, 1263.

Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

The channel between Sangalakki and the east side of Karang Buli Ulin is 2 miles broad, and without dangers.

Pulo Samama is low, covered with trees, and flooded by the sea at high water; a small detached portion on the reef, nearly 2 cables northward, appears as a separate islet. Samama can be seen 12 miles, and there is anchorage, in 16 to 20 fathoms, one to 2 miles eastward.

Karang Buli Ulin, the large reef southward of Samama, is 6 miles long and 3 miles broad; it dries generally. The north point of Kakaban in line with the south point of Sangalakki, 56° true, clears the edge of the reef.

Three other reefs, with narrow channels between, extend northward nearly to Pulo Derawan; Karang Pinaka appears as a white sandbank, only completely covered at high-water springs; northward is Karang Masimbung, a large part drying at low water. Westward of the north point of Karang Masimbung is Karang Tababinga, which seldom dries, and the north-west part, with depths less than 10 fathoms, juts out three-quarters of a mile beyond the visible edge. The passage between Tababinga and Masimbung is clear and deep, and can be safely used when the reefs are seen. The eastern side of all these reefs is steep-to.

Pulo Derawan (*Lat. 2° 17' N., Long. 118° 15' E.*), 9 miles northward of Samama, is a low, inhabited, and cultivated coral island, with a few tall trees, visible 15 miles; the surrounding reef projects one mile eastward and 2½ miles westward, but on the north and south sides is little more than a cable wide. Water is freely obtained from wells. Pilotage or other assistance may be had by application to the resident chief.

There are navigable channels both north and south of Derawan, with anchorage of about 25 fathoms in both; from November to May vessels should anchor south of the island, and in other months to the northward.

The passage on the north side of Derawan, between the edge of the island reef and the coral flats south-east of Pulo Panjang, should only be entered near low water, when the reefs are well in sight, and with the sun behind.

The channel south of Derawan is marked by two iron screw-pile beacons, with white balls, both on the south edge of the island reef; the eastern beacon is near the east end of the channel, and the western at the west end.

Tides are almost entirely semi-diurnal, with a slight single-day tide which in July and August rendered the morning tide the higher, and in November and December the evening. It is high water, at full

General charts 2660b, 1263.

Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

and change, at VIh.; springs, which occur 2 to 3 days after full and new moon, rise 8 to 9 feet; neaps range 3 to 4 feet.

Between Derawan and the shore, the flood stream runs southward, and the ebb northward. Eastward of the reefs a current will generally run south-east, but seldom amounts to more than one mile an hour.

Pulo Panjang (*Lat. 2° 22' N., Long. 118° 12' E.*), 5 miles north-west of Derawan, is $2\frac{1}{2}$ miles long and one mile broad, covered with vegetation, and can be seen 16 miles; a large portion of the island is flooded at high water, and it is uninhabited. On the north-west side there is a small rocky islet.

The island stands 4 cables within the eastern edge of a great reef, which extends south-east to the channel north of Derawan, and north-westward for 11 miles, varying in breadth from 2 to 5 miles. The reef dries in great part at low water, and can generally be seen; the east side is very steep, but on the north side there is anchorage in 12 to 19 fathoms.

Rabu, a small wooded islet 5 miles west of the south point of Panjang, is partly flooded at high water, but some tall trees are seen 14 miles; it is on an extensive line of reefs parallel with the shore.

On either side of Rabu are navigable channels, that eastward, between the islet and Panjang reef, is obstructed at the south end by shallow heads; the passage westward may be used when the reefs are clearly seen, but it cannot be recommended until properly buoyed.

The coast abreast these reefs, as far as Karang Tiga, is low, sandy, and in places marshy, with many bays closed by a bank of mud, sand, or dead coral.

KURAN or SUNGI BERAU.—At the entrance of Sungai Berau is an extensive delta, formed by many uninhabited islands, with various passages between leading to the sea. The most important channels are Muara Pantai on the south, suitable to vessels of 13 feet draught; and Muara Tidung on the north, by which ships of 15 feet may enter at high water. The shores of the islands between these two mouths are low, and without any distinctive points visible from seaward, and the waterways are only fit for small vessels. The 10-fathoms line eastward of the islands is 10 to 12 miles off, and shoals rapidly towards the flats; outside this line the depths are comparatively great, and the bottom is of light blue mud until close to the reefs southward of Pulo Derawan.

Depths.—The least depth, at low water springs, in Muara Pantai, is 6 feet, at the little isle of Sodang kecil, near the junction of the channel with the main stream of the river. In Muara Tidung the shallowest water is 9 feet, southward of Badak Badak island, some 6 miles within Tanjong Ulingan. Both these entrances are buoyed.

General charts 2666b, 1263.

Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

Muara Pantai, the southern mouth of Sungai Berau, is approached by a ship channel through the delta flats, 12 miles long, with depths of over 3 fathoms; between the entrance points Buassin and Birai, the channel narrows to 3 cables, and taking a westerly direction for 12 miles, turns northward, with a tortuous course, for another 10 miles. Tanjong Birai (*Lat. 2° 3' N., Long. 117° 55' E.*), the northern entrance, is conspicuous, with some fairly tall detached trees.

Buoys and beacons. — Off the entrance of Muara Pantai, about 13 miles east of Tanjong Buassin, and in $3\frac{1}{2}$ fathoms water, is a fairway black conical buoy with ball, marked in white letters "Berouw." A white conical buoy, with ball, on the north side of the channel, about 7 miles from Buassin. A white conical buoy with ball, also on the north side, about 2 miles north-east of Buassin.

A stake beacon (Lingard), with white triangular topmark, on the left bank southward of Sodang kechil.

Tides.—At the entrance to Muara Pantai, it is high water, full and change, at VIh.; the greatest rise, of 10 feet, is 2 or 3 days after full and new moon, neaps range 2 to 3 feet.

At Sungai Pantai, it is high water half an hour later than at the mouth, and springs range 11 to 12 feet, neaps 3 to 4 feet. Near Sodang Kechil, the high and low waters occur two hours later than at the mouth, with range 6 to 7 feet at springs, and 2 to 3 feet at neaps. The streams at the entrance turn with high and low water, the flood runs $1\frac{1}{2}$ to 2 knots, ebb nearly 3 knots, depending much on the discharge from the upper waters of the river. The flood stream is felt above the junction at Sodang kechil.

Directions.—Mount Padai, 1,132 feet high, is visible at a great distance off, and on nearer approach, the little dome-shaped hill Samiroa, of 345 feet, is seen above the low land. View at page 422. Steering for Mount Padai, bearing 276° true, will lead to the outer buoy of Muara Pantai; thence southward of the two white buoys, passing the inner at a distance of about 100 yards. From here the course is 300° true until the inner point of the river, near Samiroa, bears 272° true, then for the river mouth, and mid-channel to the village of Petemuajar, near the entrance to the Sungai Pantai; up to this part the water is deep and the shores steep-to.

From the Sungai Pantai the channel turns northward for 3 miles, with two deep bends, to the waterway leading eastward into the Muara Garura; then north for another 5 miles to the islet Sodang kechil, with bars of 6 and 7 feet water on the south and north sides. Vessels of 13 feet draught can reach this point at all times, but must await high water to cross.

General charts 2660b, 1263.

Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

When off the palm-covered point, on the left bank below Petemuajar village, the middle of Pantai river should be steered for, to avoid a small bank of 4 feet projecting $1\frac{1}{2}$ cables from the left shore, and when the channel is open keep along the east bank to the first bend, as a partly-drying bank extends from the opposite side more than half-way across. When the first bend is passed, the stream may be held midway to the second bend, then towards the east bank until near the Muara Garura passage, when the point on the west side is to be rounded close to. For some distance northward of Muara Garura the west bank must be held, then the opposite shore is gradually neared as Lingard beacon is approached, to clear a shallow flat occupying all the western side of the channel.

From Lingard beacon the course is 298° true for a conspicuous round-topped tree on the west bank, keeping the beacon right astern, the least depth here is 9 feet at low water; this course leads close along a point on the right bank, and when it comes in line with the beacon, bearing 145° true, this mark must be kept astern to pass over the second bar westward of Sodang kechil. When the north-west point of Sodang Besar is in line with the south point of Telassau island, 80° true, the main channel of the river may be entered.

Muara Tidung.—In the approach to Muara Tidung, Tanjong Ulingan (*Lat. $2^\circ 12' N.$, Long. $118^\circ 0' E.$*) is conspicuous from eastward, being sand, while the adjacent land is morass. There is a village, with a plantation of cocoanuts, near the point. Tanjong Binkar, the east point of Lalawan island, is difficult to distinguish, but to the southward is a small red wood, which, with favourable light, may be recognised.

The channel into Muara Tidung follows the direction of the shore from Tanjong Bolalang to Tanjong Ulingan, and carries a minimum depth of 3 fathoms until a mile eastward of Badak Badak island, when the water shoals to 9 feet at low-water springs. As far as Tempurung island the depth is 11 to 13 feet, afterwards increasing to more than 3 fathoms up to Telassau island, where a second bar is found with 10 to 13 feet. In this portion of the channel there are a rock with 7 feet and a small bank of 9 feet, hard bottom, under the left bank north-north-west of the west end of Tempurung island; $3\frac{1}{2}$ miles higher, in mid-channel, northward of Brangat islet, a small bank of 5 feet; and 2 miles still further up, north of the west point of Baru islet, a rock with 5 feet, very dangerous to navigation.

Buoys and beacons.—The outer part of Muara Tidung is marked, on the starboard hand entering, by two white conical buoys, and two pile-beacons with white balls; on the port hand, by two black can buoys, and one pile-beacon with black truncated cone. In addi-

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Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

tion, there are two black can buoys, and a white conical buoy, between Badak Badak and Telassau islands.

The outer white conical buoy No. 1, is on the southern edge of a bank with 9 feet water, 159° true from Tanjong Bolalang; white conical buoy No. 2, on the south side of a small bank with 6 feet water, near the south-east point of Badak Badak. The first beacon, with ball, is on the southern edge of a reef which dries, 116° true from Tanjong Bolalang; the second beacon, 1½ miles eastward of Tanjong Ulingan, in one fathom water.

On the south side of the channel, the outer black can buoy lies opposite No. 1 white buoy, on the edge of a bank of 15 feet; No. 2 black can buoy is south-west of the south point of Badak Badak. The beacon with truncated cone is on the western part of a bank which dries, on the south side of the fairway, about 2 miles east of Badak Badak.

In the inner portion of the channel, one of the black can buoys is on the edge of the bank off the channel westward of Tempurung island; the other is on the edge of the bank extending westward of the islet Baru; the white conical buoy marks the south side of the 5-foot rock northward of Baru islet.

Directions.—Entering Muara Tidung from the direction of Pulo Derawan, the course is 244° true, with the island bearing 64° true, until the outer black and white buoys are seen, and a depth of over 3 fathoms must be maintained to the beacon (*Lat. 2° 9' N., Long. 117° 57' E.*) on the south side of the channel; past the beacon the depth decreases to 12 or 13 feet, and to 9 feet southward of the white conical buoy south-east of Badak Badak, where at low-water springs the passage is very narrow.

Off the south point of Badak Badak 4 to 5 fathoms water is found, and when near the black can buoy the fairway turns north-north-west between Badak Badak and Tidung islands, keeping eastward of the line drawn along the west side of Tidung; the least depth, abreast the south point of Tidung, is 10 feet, soft mud, which increases northward, and close to the north-west point of Badak Badak there are 5 fathoms. Passing through between these islands, the Tidung side should be neared in the southern part, and the Badak Badak side in the northern; with the ebb a very strong current runs eastward north of Badak Badak.

Leaving Badak Badak island the channel is along the north bank of the river, keeping more mid-channel when the depths increase to 3 and 4 fathoms, to clear the 7-foot rock on the north shore, and avoiding the bank on the south side, which extends half-way across, and is marked by a black buoy. The shore of Lalawan island is now kept

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Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

close aboard, crossing to the opposite side when the north point of the river bears 272° true, to pass northward of a 5-foot bank, mid-channel off the islet Brangat. Brangat is a long narrow islet covered with small marsh palms and light green shrubs; at high water it appears as two islets. About 1½ miles further up is Baru islet, which appears as a small high wood, and when the east point bears 180° true, the north shore must be abandoned and the course taken south of the 5-foot rock and white conical buoy; southward of this rock a bank extends from the north side of Telassau, marked by a black can buoy. Thence towards the north shore until Sodang kechil is seen clear of the west point of Talassau island, when a south-westerly course can be steered over the 10-foot bar, and into the main stream of the river.

Muara Kassei, the passage eastward of Badak Badak island, is barred at the southern end by a ridge with 6 to 8 feet water; northward of this the depth increases up to 5 fathoms.

Sungi Berau, above the junction of the two mouths Pantai and Tidung with the main stream, takes a general westerly direction for 15 miles, when it divides off into the two streams, Makam and Kelei. From Telassau island the channel runs along the right bank of the river until past the three islands on the north side, and Bonggong kechil, the upper islet, bears 92° true; the left bank is then held, steering across for the eastern hill of Santul, until round the bend of the river and abreast the end of Sapinang besar. A shallow flat, partly dry at half tide, blocks the river westward of Sapinang besar, and the passage is by the narrow way eastward and southward of that island, known as the **Kleine Kali** (*Lat. 2° 12' N., Long. 117° 35' E.*), both sides of which are inhabited, and the land under cultivation. The fairway is sufficiently broad to allow vessels to pass each other.

In the **Kleine Kali** the right bank should be held until Tanjong Samburakat can be steered for, bearing 249° true, and when the west side of Serudang, a thickly-wooded islet westward of Sapinang, is in line with the hill of the same name, 39° true, keep this mark astern. This leads between a stony ridge extending about half a cable from Kramat hill, and a bank of 6 and 7 feet marked by a white conical buoy on the southern side. When the Sungi Bangun, on the right bank, is well open, the course is 277° true on Tanjong Upas, and then in mid-channel; in this part are 12 feet least water. From Tanjong Upas to Tanjong Premas, about 2 miles further, the left bank is held; a bank of hard ground, with 4 feet water over it, lying in the middle of the river, reduces the width of the channel considerably. From Tanjong Premas a mid-channel course may be steered, holding over to the left bank when opposite a brown patch on the very conspicuous hill Gunung Tabur.

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Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

Tanjong Redeb, the station of a Contrôleur, lies at the junction of the Sungi Makam and Kelei; the Contrôleur's house, with flagstaff in front, is on the right bank of the Sungi Makam.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Tanjong Redeb every month from Surabaya, and about every three weeks from Makassar.

Supplies.—Provisions can only be obtained in small quantities. There are usually about 100 tons of coal in store, which can be put on board at the rate of 16 to 20 tons an hour.

Sungi Kelei is navigable for vessels of 10 feet draught as far as the village Tanah Merah, a distance of about 27 miles from Tanjong Redeb, but the strong current and numerous trees standing in the water make the navigation difficult.

Sungi Makam is navigable for vessels drawing 12 to 13 feet as far as the junction of the Sungi Sidung, 22 miles above Tanjong Redeb, and vessels of 10 feet draught can reach the Sungi Kulimantan, 19 miles further up. Local knowledge or a pilot are essential for these two rivers.

The rise of tide by the Sungi Sidung is 6 to 7 feet, and high water occurs 2 to 3 hours later than at Tanjong Redeb.

Coast.—From Tanjong Batu the coast trends in a general north-westerly direction for 35 miles to Muara Seilor, the southern mouth of the Sungi Bulungan, and is low, regularly covered with casuarina trees, becoming hilly inland; by Tanjong Tanahguning is the only rocky part of the coast.

Several reefs, at distances of 3 to 4 miles off-shore, make it advisable not to approach the coast south-eastward of Tanjong Tanahguning within the 15-fathoms line.

Balik Taba (*Lat. 2° 35' N., Long. 118° 0' E.*), a coral reef one mile long and three-quarters of a mile broad, lies $8\frac{1}{2}$ miles northward of Tanjong Karang Tiga; the southern part dries, on the northern part is 3 fathoms water.

At a distance of $3\frac{1}{2}$ miles, 132° true, from the south point of Balik Taba, is a reef of 2 fathoms water.

Beacon.—On the eastern edge of Balik Taba is an iron screw pile beacon with white ball.

DIRECTIONS.—From Tanjong Mangkalihat to the Sungi Bulungan the route is eastward of the Kaniungan islands, close westward of Mataha (page 426), and between Sangalakki and Pulo Kakaban (page 428). Sangalakki can be seen from a distance of

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Chart 2636, Strait of Makassar, north part. Var. 2° 30' E.

14 miles, and Kakaban, which can be passed close-to, at 23 miles. The course thence is eastward of Derawan, Panjang, and Balik Taba.

From Sungi Berau to Sungi Bulungan.—From Muara Pantai the route is southward of Sangalakki, between that island and Kakaban, and then as above. The southern extreme of Karang Buli Ulin, the large reef southward of Samama, will be avoided by bringing the south point of Sangalakki in line with the north point of Kakaban, 56° true.

From Muara Tidung the route is through the channel southward of Pulo Derawan (page 429), and then eastward of Panjang and Balik Taba for the fairway buoy off the Muara Makapan.

SUNGI BULUNGAN.—The Sungi Kajan, the lower part of which is known as Sungi Bulungan, rises in the Babui mountains, in about lat. 1° 25' N., long. 114° 50' E. Above the village Keburan, about 6 hours steaming above Tanjong Seilor, it is only navigable for small native craft; at high water small steam vessels can reach this village, and the village Marah at all times.

Chart 3577, Sesajap and Bulungan rivers.

By Tanjong Seilor the river divides into three main branches, connected by many cross channels, thus forming a considerable delta, with low shores, not always readily seen against the high mountain land behind. Off the river mouths, in clear weather, there may be seen to the southward the isolated square top mountain Suwaran, and Mount Njapa, with three nearly equally lofty summits.

Eastward of the delta, a bank of less than 3 fathoms extends 7 to 10 miles, and the water deepens rapidly between 10 and 20 fathoms. Up to 50 fathoms the bottom is mud, and outside this black sand, which towards the 100-fathoms line is mixed with small shells and fine coral.

Of the numerous mouths of the river the Muara Makapan, north of the island Mening (*Lat. 2° 59' N., Long. 117° 39' E.*), is of the most importance for shipping. To the southward are the Muaras Pekin, Biwan, Klambu, and Seilor. The latter has depths of 6 to 7 feet over the outer bank, but the channel is not beaconsed, and can only be used by small vessels at high water. On the bank outside the Muaras Biwan and Klambu is a least depth of 5 feet water.

Buoy.—A fairway conical buoy, with black and white vertical stripes, marked "Biwan," and surmounted by a white ball, is moored before the Muara Biwan in 3 fathoms water.

Muara Makapan is a broad, deep river mouth connected to the main river by the Sungi Tamenggah, and with the Muara Salinbatu by the Sungi Kubil; the latter is of little use for shipping on account of the numerous bars of 6 to 8 feet water in it.

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Chart 3577, Sesajap and Bulungan rivers. Var. 2° 20' E.

The least depth in the Muara Makapan is 15 feet at low water springs. The Sungai Tamengguh, although winding, is sufficiently broad and deep; at its junction with the Sungai Bulungan is a bar of hard ground, with $6\frac{1}{2}$ feet least water, but it is said to have deepened here to 12 feet. With this exception ships of 11 feet draught can at all times reach Tanjong Seilor; from 4 days before, to 4 days after springs, this part of the river is navigable for vessels drawing 13 feet water.

Buoys and beacons.—Before the entrance to the Muara Makapan (*Lat. 2° 59' N., Long. 117° 49' E.*) is a black conical fairway buoy, marked “Boeloengan” in white letters, and surmounted by a ball; it lies on the southern side of a shoal of 11 feet water. On the eastern end of a dry bank to the north-westward of this buoy is a screw-pile beacon with white ball which must be kept on the starboard hand entering; $4\frac{1}{2}$ miles further is a black can buoy, surmounted by a truncated cone, to be left on the port hand.

Tides are single and double-daily, the latter largely predominating, and the single tide is not observed when the moon's declination is small.

The double-daily tide has springs 2 days after full and change, and high water at VIIh., with a rise of $7\frac{1}{2}$ feet; neaps fall the same interval after the quarters, with high water at Ih. and a rise of 2 feet.

The single-daily tide has high water, on 1st January, at IIh. p.m.; 1st April, VIIh. a.m.; 1st July, IIh. a.m.; and 1st October, VIIIh. p.m. Springs occur one day before the moon's greatest declination, with a rise of 2 feet; neaps the same interval before 0° declination, with an imperceptible range.

The highest springs are in March, at VIIh. a.m., and in September, at VIIh. p.m., as the moon's greatest declination falls about 3 days after full and change; the water rises then almost 2 feet above ordinary springs; the lowest are in January, at Ih. a.m., and July, at Ih. p.m., under the same circumstances.

Under ordinary circumstances the flood is felt to the Sungai Belugau, towards spring tides as far as Tanjong Seilor. The general strength of the flood is $1\frac{1}{2}$ miles an hour, and the ebb $2\frac{1}{2}$ miles, which may reach 4 miles by the Sungai Belugau after floods. At Tanjong Seilor springs rise 6 to 7 feet, but with floods, which occur most frequently in May and October, the water may rise fully 6 feet higher and cover the neighbouring land. Above the Sungai Belugau the water is fresh.

Directions.—For entering the Muara Makapan, Pulo Tarakan, northward of the mouth, and visible 23 to 24 miles, the

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Chart 3577, Sesajap and Bulungan rivers. Var. 2° 20' E.

Kegel and Saddle mountains, southward of the river, and the Sekata mountains, afford good bearing points.

The black fairway buoy, marked "Bulungan," must be passed on the south side, and the pile beacon steered for when in line with the western hill on Pulo Tarakan, bearing 326° true, until the black can buoy with truncated cone is in line with the Dua islets (two little woods on the north side of the mouth); 277° true; then steer for the buoy, leaving it on the port hand, and a course 232° true for the north-west point of Pulo Makapan (which has a little wood on the north side) will lead, with a least depth of 15 feet, into the channel of over 3 fathoms water. A useful mark here is the first point eastward of Tanjong Jungjung (*Lat. 2° 59' N., Long. 117° 35' E.*) in line with the north-west side of Makapan; if this point cannot be distinguished, the dead trees eastward of Jungjung are nearly always clearly visible. The north-west side of Makapan, partly clothed with mangroves, may be passed close-to, steering then for Tanjong Jungjung, a steep point covered with high light-green wood, and visible from a considerable distance. Northward of this point the river is broad and deep, and affords the best anchorage for vessels drawing 11 to 13 feet, waiting for high water to cross the bank southward of the Sungai Temenggah.

Passing close along the southern bank, and northward of Temenggah, the islet Linta, conspicuous by a little light-green wood, may be steered for, entering the Sungai Temenggah when the high clump on the west point of Mening opens out from the south-west point of Temenggah; in the bends of this river the outer banks must be held, crossing over to the starboard hand bank by the southern entrance. About half a mile further is the mouth of a small stream with a bank of 3 feet extending 65 yards from it; the course from here is 242° true on the east point of Pulo Gelap, crossing the bar of 6½ feet at low water springs; astern a very striking wood on the right bank of the Sungai Temenggah will be in line with the steep point on the left bank. When past two conspicuous round-topped trees on the left bank the depths quickly increase, and the left bank may be followed, crossing over to the right bank for the mouth of the Sungai Asas when the channel between Tulus and Gélap has closed. This side is held until approaching the Sungai Sabudah kechil, when the outer curve of the river is followed to avoid the bank extending from the Sungai Bebakung, returning to the right bank by the village Telok Pelandok; the outer curves of the river are then followed to the sharp bend opposite the Sungai Belugau.

After floods or in a strong ebb this sharp turn is troublesome, and vessels constantly touch the trees or lose their anchors. After round-

General charts 2636, 2660b, 1263.

Chart 3577, Sesajap and Bulungan rivers. Var. 2° 20' E.

ing the point the right bank is held to avoid a partly-drying bank from the opposite shore, crossing to the left bank by the Sungai Sabanar. When Tanjong Buju is in line with the right bank cross over to it, keeping the Sultan's house just outside the bank; this leads clear of a shoal of 4 feet extending nearly a cable from the left bank. By a pole beacon the left bank is returned to, as a shoal of 9 feet extends to about half the breadth of the river. The best anchorage is abreast the Sultan's house, where there are 3 fathoms at low water.

Tanjong Seilor or Bulungan, the residence of the Contrôleur of the Inland Government, lies at the beginning of the delta of the Sungai Bulungan, about 40 miles from the Muara Makapan fairway buoy. The Sultan of Bulungan resides at Tanjong Pelas, on the opposite bank. The limits of the road are between the parallels of Tanjong Buju and Seilor; the depths are 10 to 15 feet at low water springs.

There are three piers; the Government pier has 13 feet water alongside, the other two 12 feet water.

Supplies are difficult to obtain, and then only in very small quantities. There is no coal.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call once a month from Surabaya, and every three weeks from Makassar.

Muara Salinbatu, the northern mouth of the Sungai Bulungan, is about 20 miles long from the entrance to Tanjong Seilor; local knowledge, or the services of a native pilot, are essential for its navigation.

The least depth is 4 to 5 feet at low water springs.

SUNGI SESAJAP.—The Delta of this river is formed by a large number of small islands, between which three main passages give access from sea; these are subdivided by many of lesser importance. The coast here is low and flat, the only recognisable points from seaward being the islands Menulun, Tarakan, Bunju, and the Sembakung hills. From Tanjong Batu (*Lat. 3° 15' N., Long. 117° 39' E.*), the south point of Tarakan, and Menulun, the 10-fathoms lines run in an easterly direction for about 15 miles, and then turn sharply to the north and south, leaving a deep channel between. Vessels navigating along this part of the coast must remain outside the 10-fathoms line; if bound for the Sungai Sesajap, they must carefully determine their position before approaching in lesser depths. The three principal mouths are Muara Batagau, Muara Sabawang, and Muara Serban, leading into South Sesajap, Middle Sesajap, and North Sesajap.

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Chart 3577, Sesajap and Bulungan rivers. Var. 2° 20' E.

The least depth, entering by South Sesajap, is 10 feet, at its junction with the main river; by Middle Sesajap and North Sesajap, $2\frac{1}{2}$ fathoms.

Winds and weather.—Land and sea breezes are not noticeable, and there are no regular monsoons. From December to April the winds are mostly easterly and north-easterly, with frequent rain, squalls, and bad weather; from July to October, westerly winds are more usual, also with frequent rain. The remaining months of the year are changeable. The rainfall is great, seldom a week passing without rain; the climate is not very hot, and the nights are cool.

Tides are of a regular double-daily character. Springs fall with full and change, with high water at VIh. and a rise of 11 to 12 feet; the high water of neaps is at Oh., with a rise of 3 to 4 feet. Outside the islands Tarakan and Bunju the stream flows uninterruptedly to S.S.W. or S.W., with a speed of half a mile during flood tide, and 2 miles an hour with the ebb. In the delta both the flood and ebb streams are strong, especially the latter, which attains a velocity of more than 3 miles an hour after a heavy rainfall.

Coast.—Northward of Muara Salinbatu is a broad bay named Muara Sekata; the Sungai Sekata flows into the western part, and is navigable for vessels of 12 feet draught over a distance of about 6 miles. From Tanjong Kris (*Lat. 3° 17' N., Long. 117° 31' E.*), the north point of the bay, a bank extends to the southward for 2 miles.

Tarakan is a large hilly island, 462 feet high, the southern part especially being wooded with high trees; in the northern part, near Tanjong Juwata, is a hill 512 feet high, visible 23 to 24 miles.

By Tanjong Batu the reef dries out to about 4 cables, and just outside are two small banks of dead coral. Sungai Pemusian discharges on the west coast, and is navigable for small vessels over a distance of about 2 miles; on the bar are 3 feet at low water. One mile north-westward of the mouth is the village Linkas, with safe anchorage in 11 to 12 fathoms off it. About one mile to the westward of the village is a reef of $3\frac{1}{2}$ fathoms, and 6 cables, 205° true, from the southern end of the village, is a depth of 4 fathoms. Karang Siameij, drying at low water, lies 2 miles north-westward of the village, and 4 miles further is the high islet Sadou, surrounded by a reef extending a mile to southward, and with a navigable channel between it and Tarakan.

From Tanjong Sepunti, the north-west point of the island, a bank extends 4 cables, otherwise this part of the coast is clear and steep-to. There is anchorage off the village on the west side of Tanjong Juwata, in 9 to 10 fathoms. A large mudbank extends from the east side of Tarakan, the depths gradually increasing to 5 fathoms.

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Chart 3577, Sesajap and Bulungan rivers. Var. 2° 20' E.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Tarakan every fortnight from Surabaya, and every alternate month from Makassar.

Menulun is a small islet with high trees, visible 13 miles; it is surrounded by a drying reef, extending 2 miles east and west. On the west side this reef is steep-to, but on the east side it is prolonged a further 3 miles by a narrow ridge of sand, with depths gradually increasing to 5 fathoms.

Begruidé shoal, only covered at high water springs, lies 3 miles to the southward of Menulun, and is a good bearing point when navigating the channel between them.

Beacons.—The south side of the drying bank round Menulun is marked by a beacon with white ball, the north-west side by a black and red striped beacon with cone topmark. The edge of the coast reef extending from the southern point of Tarakan is marked by two beacons with ball topmarks, one abreast Tanjong Batu and the other abreast Tanjong Mengachu; neither of these must be passed close-to.

Pajau, covered with small marsh palms and vegetation, is separated from Tarakan by Batagau strait, and from the main coast by Muara Liagau and Apas Pajau; the South Sesajap flows northward of the island. Pajau is square shaped, and from all points steep-to shoals extend from half to one mile.

Buoy.—A black conical fairway buoy, surmounted by a ball, is moored off the Muara Batagau.

Bunju (Tanah Merah) is a hilly, wooded, and uninhabited island, 502 feet high. Except on the north-west side a reef extends from 3 cables to 3 miles.

Dangers southward of Bunju.—One mile to the southward of Bunju is a drying coral reef, half a mile long and one cable broad; the north and south sides are steep-to, on the east side the 3-fathoms line lies at 6 cables distance, on the west side at 8 cables from the reef.

Kruys reef (*Lat. 3° 26' N., Long. 117° 56' E.*), a coral reef of 2½ fathoms water, is 6 cables long, and 2 cables broad, steep-to, and not marked by discoloured water, occasionally a few ripples are seen; the centre of the reef lies with the south point of Bunju, 287° true, distant 4⅓ miles.

Johanna reef, with a least depth of 7 feet, is 4 miles long and 8 cables broad, and consists of hard sand; the centre lies with the south point of Bunju 326° true, distant 5 miles.

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Chart 3577, Sesajap and Bulungan rivers. Var. 2° 20' E.

Adat reef, with a least depth of $2\frac{3}{4}$ fathoms, is 9 cables long and 3 cables broad; it lies $2\frac{1}{2}$ miles to the southward of the west point of Johanna reef.

Dangers westward of Bunju.—Numerous drying banks and shoals lie westward of Bunju, and it is impracticable, or at any rate very dangerous, to attempt to reach Muara Serban through these shoals. These banks are a continuation of those extending from the east sides of Papa and Baru, and the channel to Muara Sabawang runs southward of them.

Anchorage.—The bank from the north side of Baru, which dries in parts, continues eastward to within $1\frac{3}{10}$ miles of the north point of Bunju; between this bank and the north-west coast of Bunju there is anchorage in 7 fathoms.

Dangers eastward of Bunju.—To the north-eastward of Bunju is a broad mudbank, with a least depth of 2 fathoms; between this bank and the island is an oblong bank of hard sand, drying in three places, the depths otherwise being one to $1\frac{1}{2}$ fathoms.

Two miles to the northward of Kruys reef is a narrow ridge with a least depth of $3\frac{3}{4}$ fathoms, and depths of 7 to 8 fathoms around. From the east side of Bunju the coast reef projects to 3 miles in parts.

South Sesajap, entered from seaward through Muara Batagau, runs in a general west-north-westerly direction north of Pajau and southward of the large island Bangkudulis; round the west side of the latter island it curves round to the northward, and unites with the main river.

On the northern side of the first wide portion of the South Sesajap are the four islets Fanny, Kapal, Serang, and Umbus, and a considerable mudbank lines the southern shore. The principal tributaries are the Natek, Tiladan, and Batajau. The last-named is of little importance, as there are no settlements on it; for 10 miles it is about 100 yards broad, with $2\frac{1}{2}$ fathoms least water. The Sungai Tiladan has a breadth of about 750 yards, and depths of 5 fathoms as far as the junction of the Sungai Bukit Pondok, 4 miles up stream, the latter is occasionally visited by a vessel of the Royal Netherlands Steam Packet Company.

Middle Sesajap flows between the islands Tibi and Bangkudulis kechil, on the north side, and Bangkudulis on the south side. From the entrance, opposite Tanjong Juwata (*Lat. 3° 27' N., Long. 117° 33' E.*) to its junction with North Sesajap, westward of Bangkudulis kechil, the length is about 26 miles.

North Sesajap.—By the west point of Baru the North Sesajap splits into two mouths, the Muara Sabawang and Muara

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Chart 3577, Sesajap and Bulungan rivers. Var. 2° 20' E.

Serban. The southern side of Muara Sabawang is formed by Tibi, the northern by Baru and the banks extending eastward; southward of Baru are the islets Batok and Papa. The Muara Serban flows between the islands Bunju and Baru on the south side, and Mandul and the main coast on the north side; a large bank projects from the north shore, extending 7 miles eastward before bending to the northward. The North Sesajap unites with the Muara Serban through the clear deep passage between Tembagan and Baru; at the eastern entrance to this channel is a bank of $2\frac{3}{4}$ fathoms. After the junction of the Muaras Serban and Sabawang, by the west point of Baru, the North Sesajap takes a general westerly direction; on the south side are the islands Bangkudulis kechil and Tipus, on the north side the three Tiga islets. The small islet Bahap lies just westward of the junction with the Middle Sesajap, and here is found the least depth in the North Sesajap, a bar of $2\frac{1}{2}$ fathoms water.

DIRECTIONS. — Southward of Tarakan and Menulun through South Sesajap.—From well outside the 10-fathoms line the south point of Tarakan must be steered for on the bearing 282° true, until the black fairway buoy comes in sight, this point and the east side of Bunju being useful marks for checking the position. The current sets to the southward, the lead must be kept going, and until soundings are obtained the above bearing carefully held.

By the fairway buoy Menulun usually comes in sight, and may be steered for, keeping it later on the starboard bow, and steering through the channel southward of it; a beacon with ball topmark marks the southern edge of the drying bank. When Menulun opens to the eastward of Tarakan a north-westerly course may be steered, shaping course for Batagau strait when the south point of Tarakan bears 76° true, and passing the beacon on the north-west edge of the drying reef round Menulun at not less than three-quarters of a mile. Abreast Tanjong Kris (*Lat.* $3^\circ 17' N.$, *Long.* $117^\circ 31' E.$) hold the left hand shore, keeping Batagau strait open to clear the shoal round Sadou islet. If making use of the channel between Menulun and Tarakan, the two beacons marking the reef on the south side of the latter island must not be rounded closely.

In Batagau strait keep in mid-channel, giving the north-west point of Pajau a wide berth when rounding it to enter the South Sesajap, steering then for the islet Kapal.

Ships of small draught find a shorter route through Muara Liagau and Apas Pajau, and vessels drawing 5 or 6 feet water through the Sungis Liagau and Natek.

General charts 2636, 2576, 2660b, 1263.

Chart 3577, Sesajap and Bulungan rivers. Var. 2° 20' E.

In the South Sesajap the route is close southward of the islets Kapal and Serang, then across to the northern shore until just past the Sungai Batajau, when the western shore is gradually closed, keeping this until the passage northward is entirely open, and a mid-channel course is taken to the northern entrance, when 10 feet, the least water, is found. This part is very liable to alteration, and it is advisable to wait for rising water.

Between Bunju and Tarakan through Middle Sesajap.—From eastward steer for the south-west side of Bunju on the bearing 302 true, between Kruys and Johanna reefs, until the east side of that island bears about 328° true, when course may be shaped more to the westward, taking care not to approach the south point of Bunju within 1½ miles. When this latter point bears 2° true the course is 272° true until the west point of Bunju bears 2° true, steering then for Tanjong Tibi (*Lat. 3° 29' N., Long. 117° 37' E.*), with course 292° true, and passing southward of the banks between Tibi and Bunju.

When the passage between Tibi and Tarakan is entirely open keep in mid-channel, with a westerly course, making for the entrance to the Middle Sesajap when just westward of Juwata hill; the western entrance point should be steered for here to clear the bank before the Sungai Tibi, keeping afterwards in mid-channel as far as the islands southward of Bangkudulis kechil, when the southern shore is closed. In the last bend, just before entering the North Sesajap, is a patch of 3 fathoms, and the north bank must be kept here. In the North Sesajap the course is northward of the islet Bahap, and thence over the bar of 2½ fathoms least water.

From southward the route is between the large bank projecting eastward of Tarakan and Adat reef, steering for Tanjong Tibi when the north-east point of Tarakan bears 282° true, then proceeding as above.

Between Bunju and Tarakan through North Sesajap.—For this route the above directions are followed until just before the southern high point on the east coast of Tarakan is closed behind the middle point on that coast, when the course is 8° true between the bank projecting eastward of Tibi and the southern of the banks between that island and Bunju. Turning into the Muara Sabawang when open, a mid-channel course may be taken, keeping rather to the Tibi shore, and crossing over to the northern side when clear of the bank extending from the west side of Batok. When the largest Tiga island is wholly open from Bangkudulis kechil, the southern shore is held, passing northward of Bahap, across the bar of 2½ fathoms, and thence over to the northern shore of the Sungai Sesajap.

General charts 2636, 2576, 2660b, 1263.

Chart 3577, Sesajap and Bulungan rivers. Var. 2° 20' E.

Northward of Bunju through the North Sesajap.—

From outside the 10-fathoms line the north point of Bunju is steered for on the bearing 272° true, altering course to 278° true when the south point of the island bears 232° true, and keeping the lead going; about 2 miles further depths of 3½ to 4½ fathoms will be sounded. When abreast the north point of Bunju the course is 263° true, and abreast the east point of Baru, 272° true, making for the channel between Tembagan and Baru when open, and crossing the bar of 2¾ fathoms at the entrance; the remainder of this channel is deep and clear, the southern shore must be held at the western entrance, thence crossing over to the northern shore of the North Sesajap and proceeding as previously described.

Sungi Sesajap is formed by numerous streams rising in the central mountain range of Borneo. At fully 54 miles from the mouth the river bears the name of **Malino**, and further up is only navigable for small vessels; 5 miles eastward it takes the name **Sesajap**, and is navigable for large vessels. The principal village **Sesajap**, and the villages **Haji Somail** and **Kabiran**, lie, respectively, 12, 32, and 54 miles up stream from the junction of the North and South Sesajap.

On the whole the river is broad, deep, and tolerably clear. Just above the entrance the island **Belanak** (*Lat. 3° 37' N., Long. 117° 11' E.*) lies under the right bank, with a drying bank northward, higher up are the islands **Sesajap** and **Sapunti**, and in the further bends lie numerous banks and islets.

The depth to the village **Sesajap** varies from 3 to 9 fathoms; close by the village **Haji Somail** is a bar of one fathom, and the least depth from there to 5 miles below **Kabiran** is 1½ fathoms. Ebb and flood are noticeable almost to the latter village, and the water is fresh from just above **Belanak**.

The navigation of the river presents no difficulty, the channel at the commencement is along the left bank, then between the islands **Sesajap** and **Sapunti**, and across to the right bank, thence following the curves and avoiding the points as usual in most rivers.

Chart 2636, Strait of Makassar, north part.

Sungi Sembakung, immediately north of the **Sesajap**, reaches the sea by two branches, the northern discharges into the outer part of the **Sesajap** delta, and is fronted by a bank with shallow water; the southern entrance is through the **Muara Serban**, **Muara Ledung**, and **Trusan Gelagan**, and is navigable by vessels of 12 feet draught, to the village **Sembakung**, a distance of 35 miles. The water is fresh at about 20 miles from the mouth, but the flood of spring tides is felt at 40 miles up. The average width of the upper part of the river is 300 yards, and the shores are clothed with almost impenetrable forest.

General charts 2636, 2576, 2660b, 1263.

Chart 2576, Sulu archipelago. Var. 2° 20' E.

Coast.—From Tanjong Ahus, 12 miles north of Bunju, the coast runs in a north-westerly direction to the mouth of the Sungi Sibuko, and then turns to the north-eastward to Burs point (*Lat. 4° 10' N., Long. 117° 38' E.*). The Sungis Sibuko, Sibakies, and Simengaris flow out in this part of the coast, forming a delta, in which are the islands Ahus and Bukat. Northward of the mouth of Simengaris is the island Tina Basan, separated from the coast by the Trusan of the same name.

Banda reef, a small reef of sand and stones, with one fathom water over it, lies 11 miles, 75° true, from Tanjong Ahus.

Chart 2099, North-western part of Sibuko bay.

Sungi Sibuko, although the largest of the many streams running through the low land forming the north-western part of Sibuko or St. Lucia bay, is of little importance; for ocean vessels it is only navigable over a length of 15 miles, steamboats can reach the village Sibuko, 46 miles from the mouth. In the river mouth lie the islets Tembalan, Senelak, Pelanduk, and Sikapal; Senelak, the largest, has three hills, the southern rising to a height of 344 feet. Sungi Sibuko is remarkable from having a bore at full moon; the advance of the wave up the river can be heard from a distance.

About 4 miles from the mouth the Sungi Itai branches off in a south-south-easterly direction, and joins with the Sungi Ahus by the island of that name. The least depth in these two rivers is 1½ fathoms, by the north-west point of Ahus.

Sungis Sibakies and Simengaris, two streams northward of Sibuko, unite in a common mouth 2 miles wide; from Tanjong Bakies, the dividing point, a narrow drying ridge of sand projects 2½ miles eastward.

The Sungi Sibakies is of very little importance, as there are no settlements on the banks, and 6 miles up it becomes very narrow. The Sungi Simengaris is navigable for small vessels to the village Simengaris, 14 miles from the mouth.

East Nonokong (Nunukan) is a densely wooded hilly island 876 feet high, visible from a great distance. An extensive bank dries out 3 miles from the south-east point, and a spit of less than 3 fathoms projects for a further 7 miles.

The boundary between the Netherlands and British possessions is the parallel of 4° 10' N., marked by stone beacons where the line cuts the coasts of Sibetik island, and of the mainland abreast.

The coast of Borneo northward of East Nonokong is described in Eastern Archipelago Pilot, Part I.

General charts 2636, 2576, 2660b, 1263.

CHAPTER XII.

SOUTH, EAST, AND NORTH COASTS OF CELEBES.—SALAYAR AND BUTON STRAITS.—TUKANG BESI, BANGAAI, AND SULA ISLANDS.

VARIATION IN 1914.—Increasing one to two minutes annually.

Chart 941b, Eastern archipelago, western portion. Var. 2° 30' E.

SOUTH COAST OF CELEBES.—From Ujong Laikang (page 382), the coast trends generally to the east-south-eastward for 16 miles, to Tanjong Bulu Bulu (*Lat. 5° 42' S., Long. 119° 43' E.*), the south point of Celebes, including the bays Laikang and Malasoro. Between Ujong Bulu Bulu and Tanjong Lassa, 45 miles to the eastward, the coast makes a bend to the northward, generally known as Bonthain bay; in this bay there are depths of from 12 to 30 fathoms, affording anchorage for vessels taking Salayar strait, and forming a guide to position by night. The great post road from Makassar to Sinjai runs close along the coast.

Mountains.—The land from Bonthain slopes up to Mount Lampo (Lompo) Batang, or Peak of Bonthain, 9,981 feet high, and the highest mountain in Celebes. The mountains in the foreground of this peak form two main groups. The western consists of a series of ridges descending to the coast from Mount Bontomanai, the northern and highest summit. The other is a continuation of one of the slopes of Mount Lampo Batang, and splits into two branches by Mount Damara, one running to the head of Malasoro bay and the other in a north-westerly direction.

Of the western group Mount Bontomanai, of 2,995 feet, and thickly wooded, is most conspicuous, and seen from south-westward has a sharp top; Mount Chinalu, 984 feet high, is a very conspicuous isolated hill, covered alternately with light-green reeds and dark woods.

Of the eastern group Maja, of 3,757 feet, is the highest and most conspicuous, showing as a wooded conical summit; Bulu Pingka, 2,018 feet, has steep slopes and a fantastic outline, with two deep vertical clefts in the peak; Batu Jawia, 1,148 feet, is conspicuous from westward by a dark clump on the light-green ridge; Sirukang, 669 feet, is a round dark wooded hill. View at page 450.

Further eastward the only mountain of note is Slangenberg, 1,388 feet high, a steep, pointed, thickly wooded cone, rising out of

General charts 1293, 2637, 3616, 941b, 1263, 2759a.

Chart 941b, Eastern archipelago, western portion. Var. 2° 30' E.

the surrounding flat land, and the most conspicuous point on the whole of this part of the coast.

Winds and weather.—The monsoons here blow with much steadiness, especially the eastern, which begins in the end of April, and blows strongly until October, from east-south-east by day, and, under the influence of the land wind, east-north-east at night. The western monsoon commences in December, from west-north-west, and is at its height in January, with heavy squalls; in February and March unsteady winds will blow between south-west and north. The land wind is seldom felt at this season.

Rain is most abundant in December and January, lessening in February and March; at coast stations the rainy period will last until June.

In the east monsoon the sky is hazy, particularly in August and September; during the west monsoon it is generally overcast, and bright periods only occur towards the end of the westerly winds.

Currents are not usually strong, but are very unsteady, being largely due to prevailing winds; the average rate is about half a mile an hour, but a set of 40 to 50 miles to the westward has been experienced in 24 hours. A short chopping sea is often met with.

Tidal streams, near the coast and in narrow passages, will run one to 2 knots.

Plan of Laikang and Malasoro bays on 3128.

Laikang bay (Turatte), immediately eastward of Ujong Laikang, is 4 miles wide between the sandy Ujong Pepe (*Lat. 5° 36' S., Long. 119° 29' E.*) on the west and Ujong Kasi Matimpowa on the east, but the fairway is considerably reduced by shallow water extending $1\frac{1}{2}$ miles from the former, and three shoals, of $1\frac{1}{2}$ fathoms least water, from the latter point; off the northern shore are four patches of stones surrounded by brown sand, partly drying at low water.

The little town Allu, the head-quarters of the Contrôleur of the Bangkala division, is about a mile up the river of the same name on the north-eastern side of the bay, and can be reached by boats. The lagoon Tamparang keke, partly dry at low water, was formerly a notorious resort of pirates.

Near the north-east shore are three small darkly-wooded hills, Karampuwang, the central, is 374 feet high; the eastern, Labuchinri, is lower; and the western is further inland. Mount Bontomanai in line with Karampuwang or Labuchinri leads clear of the entrance reefs; Talampuwang, a gently sloping hill, 243 feet high, in the north-western part of the bay, can be seen from almost all directions seaward, and affords a useful bearing point.

General charts 1293, 2637, 941b, 1263, 2759a.

Plan of Laikang and Malasoro bays on 3128. Var. 2° 30' E.

In the upper part of the bay are two shallow creeks, the northern named Bangkala, and the western Liballu bay. Good anchorage may be had off the dark timbered Ujong Puntondo, the southern point of the latter.

Malasoro bay, about $2\frac{1}{2}$ miles wide, affords good secure anchorage in both monsoons, and is separated from Laikang bay by the peninsula Malasoro. The islet Malasoro, 130 feet high, lies on the west side of the bay, and is surrounded by a reef extending half a mile to the south-eastward; from the opposite point, by the village Kalumpang, the reef dries three-quarters of a mile, and shallow water extends out over a mile, leaving a clear passage one mile broad. Northward of Malasoro the bay broadens, with regular depths of 6 to 10 fathoms.

On the north shore Bojong Chinnong, 377 feet high, with two white patches at the base, is conspicuous; at the mouth of the Sungai Tamanroja, which can be reached at half tide by light vessels, are four solitary trees, and 2 miles eastward of the mouth is a 298-feet high light-green hill, with a dark tree on the southern slope. The best landing place is by Ujong Batu, eastward of Kassika village.

Ujong Kayuleleng (Matete), the eastern point of the bay, is low, and covered with dark shrubs. It is advisable not to approach the coast here within $1\frac{1}{2}$ miles, as the depths southward of the point are very irregular.

The bay may be entered with the white patches on Bojong Chinnong bearing 50° true; or with the remarkable cleft summit of Bulu Pingka in line with the dark wooded hill Sirukang, 21° true. (View at page 450.)

Water of good quality may be obtained from streams on the north side of the bay.

Jeneponito (*Lat. $5^\circ 42'$ S., Long. $119^\circ 43'$ E.*), half a mile eastward of the slightly outward curving Ujong Bulu Bulu, lies on the right-bank of the river of the same name, and on the post road joining Makassar and Sinjai. The mouth of the river is closed by a sand-bank at low water, but two channels, generally indicated by native beacons, give access for small vessels at half tide. In clear weather the conical summit Maja bearing 358° true, leads to the river mouth.

Between Jeneponito and Tanjong Tibutibulu, a low wooded point about 4 miles to the eastward, the 3-fathoms line runs very irregularly, and in one place is fully 8 cables from the shore. Japara rock, with less than 6 feet water over it, is charted $1\frac{7}{10}$ miles south-eastward of the mouth of the Sungai Jeneponito, but its position is doubtful. A $2\frac{1}{2}$ -fathoms patch lies $2\frac{1}{2}$ miles, 120° true, from the mouth of the river.

General charts 2637, 3616, 941b, 1263, 2759a.

Plan of Bonthain road on 2674. Var. 2° 30' E.

Bonthain, the principal place of the district of the same name, lies at the foot of the mountains, and consists of two parallel rows of houses about 200 to 300 yards apart, extending a considerable distance along the shore, with numerous villages between the lines. The population is about 7,000, including a large number of Europeans, Chinese, Buginese, and Makassars. The place is not prosperous, and coffee is the principal export.

Bonthain road is within the limits of a circle of one mile radius from the flagstaff (*Lat. 5° 33' S., Long. 119° 56' E.*). In the east monsoon there is frequently a ground swell, and in southerly winds landing is difficult; the best anchorage is in about 5 fathoms, at 8 cables 232° true from the flagstaff. A shoal of $2\frac{1}{2}$ fathoms lies $3\frac{3}{10}$ miles, 215° true, from the flagstaff, and a northerly course should be steered entering the road to avoid the other shoals on the west side of the bay; a dark roof, with a white stripe down the middle, on a high white house is conspicuous.

Tides.—At Bonthain the tide is mixed with a preponderating double-daily character. The double-daily tide has springs about 5 days after full and change, with high water at IVh. and a rise of 2 feet; neaps occur the same interval after the quarters, the rise is inappreciable.

The single-daily tide has high water on 1st January, at VIIh. p.m.; 1st April, Ih. p.m.; 1st July, VIIh. a.m.; and 1st October, Ih. a.m.; springs fall one day after the greatest declination of the moon, with a rise of fully 2 feet; neaps the same interval after 0° moon's declination, with a rise of fully one foot. About the second half of June and December this increases to 3 feet at springs and 2 feet at neaps, and the second half of March and September decreases to barely 2 feet at springs and about 6 inches at neaps.

The high and low waters of both groups cannot fall together. The highest water levels are reached about the middle of February and August, at IVh. p.m. and IVh. a.m., respectively; the lowest about the middle of May and November, about Xh. p.m. and Xh. a.m. When 0° moon's declination falls 4 days after the quarters the movement of the water is very small.

Plan of Bulekomba and Bintaru roads on 2196.

Bulekomba, a large village at the mouth of the Sungi Teko, is easily recognised by the white light-tower. Eastward of the lighthouse the lying is bad and communication with the shore always difficult on account of the continual surf before the mouth of the river; the best anchorage is off Bintaru village.

General charts 2637, 3616, 941b, 942a, 1263, 2759a.

(a)

Ujong Laikang.

Ujong Malasoro.

Bulu Pingka.

Chinalu.

Gondolo. Bontomanai.

Batu Javia.

Maja.

Lampo Batang.

(b)

Ujong Balangfodo.

Malasoro islet.

*Ujong Lompo.
Strikang.*

Sukang.

Rojong Chinnong.

(c)

Sungai Tananroja.

*Ujong Batu,
69° true, 4 m.*

Kalumpang.

Ujong Kajiteleng.

Ujong Bulu Bulu.

*Bulu Pingka in line with Strikang,
bearing 21° true.*

Celebes, south coast; Malasoro bay.

Janko hill.

Square wood.

Likang Loeve. Tanjong Lassa.

Sarontang.

*Pamalata lighthouse,
bearing 87° true, 6 m.*

Salayar strait from the westward.

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Plan of Bulekomba and Bintaru roads on 2196. Var. 2° 30' E.

Shoal.—A stony patch of $2\frac{1}{2}$ fathoms lies about one mile south-westward of the lighthouse.

LIGHT (Lat. $5^{\circ} 34' S.$, Long. $120^{\circ} 12' E.$). — A white group occulting light, showing three eclipses *every thirty seconds*, thus:—light, *fifteen seconds*; eclipse, *three seconds*; light, *three seconds*; eclipse, *three seconds*; light, *three seconds*; eclipse, *three seconds*, is exhibited, at an elevation of 49 feet above high water, from a white iron framework, 42 feet high, situated on Tanjong Papanambeja, near Bulekomba. It is visible from a distance of 12 miles. For the arc of visibility, *see* Light list and plan.

Directions.—From Bonthain to Bulekomba the ground is very uneven, and Tanjongs Kurum Batu and Karampuang must be given a wide berth.

For Bulekomba road, from the southward, steer for the lighthouse in line with Slangenbergh, bearing 342° true, between Taka Boloh and Taka Rangkap (page 452), and thence for the anchorage, $1\frac{1}{2}$ miles eastward of the lighthouse. At night great care must be taken to keep this bearing of the light, as a fairly strong stream runs.

Chart 3616, Tomori gulf to Salayar strait.

Birang Kéké bay.—About 5 miles eastward of Bulekomba the coast curves in considerably, forming Birang Kéké bay, where there is good anchorage in about 14 fathoms in both monsoons; the absence of any anchorage further eastward, with the exception of Lukang Lowe, increases the importance of this.

Tanjong Lassa (Bira), the northern point of Salayar strait, and south-west of the Gulf of Boni, is sharp and precipitous, rising to a flat-topped hill 400 feet high, named Janko; off the point are some loose stones, always above water. The coast reef is 2 cables wide, and a submerged ridge projects $2\frac{1}{2}$ miles to the southward, with a least depth of 19 fathoms. Two and a half miles west of Tanjong Lassa is Tanjong Bara, with an in-curving coast between.

SALAYAR STRAIT, about 10 miles across, between Tanjong Lassa and Salayar island, is a highway for commerce between the Moluccas and Java, and the direct route from Pitt passage to the straits of Sunda, Bali, Lombok, and Alas. In the strait are three islets:—

Lukang Lowe, or North island, 2 miles to the south-westward of Tanjong Lassa, is 170 feet high, and rocky, with villages on the north-east side and many cocoanut trees. The surrounding reef extends off most on the south-east side, and is steep-to.

Anchorage.—On the south-west side of Lukang Lowe there is anchorage in 12 fathoms, sand, with the north-west point of the island in line with the left part of the hill on Tanjong Lassa, and Sarontang

General charts 3616, 941b, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 30' E.

over the south-west point. In the east monsoon there is some shelter here from wind and sea, but there is nearly always swell, and a strong current running to the W.N.W., with a velocity of 2 to 3 miles an hour.

Sarontang, or Middle island, 137 feet high, and nearly in the middle of the strait, is rocky, uninhabited, and slightly wooded; there is a surrounding reef, and on the south side the 5-fathoms line is 3 cables from shore.

Pamatata, or South island (Pasi Tanette), is 194 feet high, steep on the north side, and stands on the edge of the 100-fathoms line surrounding Salayar. A few cocoanut palms grow on the low south side of the island.

The fairways are clear on either side of Lukang Lowe and Sarontang, the one between Sarontang and Pamatata is chiefly used, being fully 3 miles broad, with depths of 300 to 400 fathoms, which quickly deepen eastward to 1,200 fathoms.

The channel between Pamatata and Salayar is reduced by reefs from both sides to less than half a mile in width, and although the least depth is 15 fathoms, violent and irregular tidal streams render it unfit for any but small vessels.

Through all the passages of Salayar strait strong currents and eddies are frequently experienced, and, when running against the wind, will cause overfalls resembling surf in shallow water; there is often a strong counter current under the Celebes shore. From June to September, at the height of the east monsoon, there is a constant current of fully one mile an hour to the south-westward; at the decline of the monsoon it takes a westerly direction, with a speed of half a mile.

LIGHT (*Lat. 5° 45' N., Long. 120° 30' E.*). — A white group flashing light every ten seconds, showing two flashes of four-tenths of a second each, eclipse between flashes two and one-tenth seconds, between groups seven and one-tenth seconds, is exhibited, at an elevation of 148 feet, from a white iron framework, 67 feet high, situated on the north side of Pamatata. It is visible from a distance of 18 miles. For the arc of visibility, see Light list.

Dangers.—**Taka Boloh**, 15 miles, 237° true from Lukang Lowe, is of sand and coral, circular, and about half a mile across, with a least depth of 4 fathoms; the 100-fathoms line runs close to the east side, elsewhere the depths increase gradually, a depth of 19 fathoms being charted about 3 miles to the southward.

Taka Rankap, 9 miles 264° true, from the south point of Lukang Lowe, is one mile long, east and west, half a mile broad, and formed of coral, sand, and stones; the least depth is 2½ fathoms, with 10 to 20 fathoms around. The water is of a light green colour, and sometimes there are rippings.

General charts 941b, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 30' E.

Four miles westward of Lukang Lowe, a depth of $6\frac{1}{2}$ fathoms is shown, and a sunken rock 4 miles 300° true.

Directions for Salayar strait.—From westward Taka Boloh and Rangkap can easily be avoided by bearings of the flat hill Janko on Tanjong Lassa, Lukang Lowe, Pamatata, and the high land on Salayar; further in the strait, Sarontang and a very conspicuous square wood on the edge of the high plateau, about 7 miles southward of the north point of Salayar, are useful marks. Course may be steered to pass close northward of Pamatata, but Sarontang must not be approached within 3 cables. (View at page 450.)

At night the Celebes shore may be approached to keep Bulekomba light in sight, and Pamatata light, bearing 95° true, will lead between Taka Boloh and Taka Rangkap, 2 miles southward of the latter.

PULO SALAYAR has a length of about 44 miles, north and south, with a greatest width of 7 miles, and is traversed throughout by a terrace-forming chain of mountains, descending steeply to the sea on the eastern side, and sloping gradually to the flat stretch of coast on the western side. Numerous roads intersect the island, the principal, about 20 feet broad, runs from Tanga Tanga village in the north to Baram Barang (*Lat. $6^\circ 24'$ S., Long. $120^\circ 28'$ E.*) in the south. Little is known of the east coast, but the west has been accurately surveyed.

Mountains.—The north point of Salayar rises to a plateau 384 feet high, separated from the higher land southward by a deep saddle, which, seen from a distance east or west, has the appearance of an island, and it is sometimes mistaken for Pamatata. A few miles to the southward a plateau rises steeply to a height of 1,093 feet, and has a square wood on the northern edge. In the southern half of the island are Salayar, 1,811 feet; Rokoboko, 1,339 feet; Pankaja, 1,476 feet; and Lajolo, 2,057 feet; and the highest summit, south of Lajolo, Mount Ganrang, 1,565 feet high, is conspicuous from northward. The two southern summits are Baram Barang, 866 feet high, with a square hump on the top, and Barangeja, with a sharp top.

Population.—The inhabitants, which in 1880 were estimated at about 57,000, consist of a mixed branch of the Makassar race, and are a pleasant, industrious, thrifty people of the Mohammedan faith; they are under nine regents, subordinate to the European government.

The principal exports are cotton, copra, cocoa-nuts and kanari nuts, from which oil is extracted, tobacco, trepang, tortoiseshell, and salt.

East coast.—Of the east coast little is known. In 1877 the Netherlands man-of-war *Soerabaja* reported discoloured water

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Chart 3616, Tomori gulf to Salayar strait. Var. 2° 30' E.

1½ miles from the coast in lat. 6° 2' S. Pasir Putih (reef) is charted about 5 miles from the coast in lat. 6° 16' S.

West coast.—Almost everywhere along the west coast are signs of habitation; the principal villages between Tanjong Matainji and Salayar are Tanga Tanga, Balangnipa, Baruy, Barugaja, and Bonea. The only streams of any importance are the Bangsiang, Tamanroja, and Tola, but they can only be entered by praus. The land becomes higher by the village Balangnipa (*Lat. 5° 55' S., Long. 120° 27' E.*), and runs in two parallel ridges, the eastern being the higher; the coast, on which are many cocoanut trees, is bordered by a reef drying off half a mile. Close to the coast reef, between Tanga Tanga and Balangnipa, are two small reefs of 5 and 3 fathoms, and near the mouth of the Sungi Tamanroja is a reef of 5 fathoms.

Plan of channel between Salayar and Pasi on 2674.

Pasi or Varkens island, parallel to the west side of Salayar, is about 6 miles long and 2 miles broad at the south end, where it rises in a line of hills to 320 feet; the north end is low and covered with cocoanut trees, a hilly ridge rising to 190 feet about 1½ miles to the southward. Mambosi and Dopa are the two principal villages on the east coast, and Balajaha on the west side. The surrounding reef, which is very narrow on the east side of the island, extends 1½ miles north-westward of Tanjong Baruja, the north point, and is from a quarter to half a mile wide on the west and south sides.

Chart 3616, Tomori gulf to Salayar strait.

Whale reefs consist of three detached groups of shoals of 2 to 4 fathoms least depth, and passages of 12 to 35 fathoms between; the outer shoal, of 4 fathoms, lies near the 100-fathoms line, and is steep-to on the western side.

Plan of channel between Salayar and Pasi on 2674.

Channel between Pasi and Salayar.—The channel between Pasi and Salayar is about 1½ miles wide, except in the southerly part, when it contracts to 2 cables. The town of Salayar lies on the eastern side of the strait opposite the north point of Pasi, and 2 miles to the northward is the village Apabatu, with a very remarkable gap in the hills southward of it; there is a similar gap southward of Salayar. The village Padang is on the eastern side of the narrows.

A number of reefs divide the northern part of the channel into two parts, the western being used by vessels of deep draught, and the eastern by praus. In the narrows the depths decrease to 2 fathoms, the bottom being hard sand covered by a layer of mud.

General charts 3616, 941b, 942a, 1263, 2759a.

Plan of channel between Salayar and Pasi on 267½. Var. 2° 30' E.

Reefs.—Before the northern entrance to the channel, at a distance of 1½ miles to the northward of Tanjong Baruja, lies a reef of about one cable diameter and 3 fathoms water, with depths of 10 to 28 fathoms around; 3 cables, 16° true, from the eastern extreme of the same point is a reef of 3½ fathoms. In the middle of the fairway, eastward of Tanjong Baruja, are three reefs; the western and largest has a least depth of one fathom, on the other two are 3 and 2½ fathoms water. Off the town of Salayar are five reefs, the two western drying at low water; the remaining three have depths of one fathom, 3 feet, and 2 fathoms over them. A small drying reef lies 7 cables to the north-westward of the village Baraja.

In the southern entrance to the channel, half a mile off the south-east point of Pasi, is a reef of 3 feet least water, and 3 cables to the north-eastward lies a shoal of 4 fathoms water.

At from 2 to 4½ miles southward of Pasi, and at 1½ miles from the coast, are several patches having from 2½ to 5 fathoms water over them.

Buoy and beacon.—The one-fathom reef in the middle of the fairway, eastward of Tanjong Baruja, is marked on the western side by a beacon with black truncated cone, and a black can buoy is moored off the southern edge. The 3-fathoms reef close eastward of it is marked by a bamboo stake.

Salayar (*Lat. 6° 7' S., Long. 120° 28' E.*) is the chief town in Salayar island and the seat of the Netherlands administration. The boat pier, near the flagstaff, can only be reached at high water. Besides the gaps already mentioned, a zinc roof near the pier is a conspicuous object. Fresh water is obtained from two large cisterns on the site of the old fort. The population in 1905 was about 1,100.

In westerly winds there is a heavy sea in the road; vessels then anchor near the Pasi shore, about 2 miles further southward.

Communication.—Vessels of the Royal Netherlands Packet Company call at Salayar twice a month from Makassar to Gulf of Boni and back.

Tides at Salayar are of mixed character, the double and single day being of about equal value.

The double-daily character is most in evidence when 0° moon's declination falls about 2 days after full and change; in the second half of March and September it is then almost purely double-daily. When the greatest half-monthly declination of the moon falls about 2 days after the quarters the character is single-daily, the strongest in the second half of June and December.

General charts 3616, 941b, 942a, 1263, 2759a.

Plan of channel between Salayar and Pasi on 2674. Var. 2° 30' E.

The double-daily tide has springs $2\frac{1}{2}$ days after full and change, with high water at IIh. and a rise of fully 3 feet; neaps fall the same interval after the quarters, with high water at VIIIh. and a rise of nearly 2 feet.

The single-daily tide has high water on 1st January, at VIIh. p.m.; 1st April, Ih. p.m.; 1st July, VIIh. a.m.; and 1st October, Ih. a.m.; with springs half a day after the greatest declination of the moon and a rise of about 4 feet, neaps the same interval after 0° moon's declination, with a rise of about one foot. In the second half of June and December the range of both increases to $4\frac{1}{2}$ and $1\frac{1}{2}$ feet, respectively; in the second half of March and September this decreases to 3 feet at springs, neaps being imperceptible.

The high waters of both groups cannot fall together, but the low waters coincide when the moon's greatest declination in the second half of June and December falls 2 days after full and change, at VIIIh. p.m. and VIIIh. a.m., respectively.

In the narrow passage between Pasi and Salayar there is very little current. On the west side of Pasi the stream runs to the northward, with rising, and to the southward with falling, water, with a velocity of three-quarters to $1\frac{1}{2}$ miles an hour. Northward of Pasi the ordinary tidal streams never exceed one to $1\frac{1}{2}$ miles an hour, but southward of the island a rate of 3 miles to the north-westward was measured. In the easterly monsoon the stream to south-eastward will raise a very turbulent sea.

Directions.—Approaching Salayar from northward course should be steered between Tanjong Baruja (*Lat. 6° 6' S., Long. 120° 26' E.*) and the beacon on the western edge of the one-fathom reef, and then steering for the zinc roof on the bearing 112° true, passing the black can buoy on the port hand; both beacon and buoy may be passed at 30 yards distance. The anchorage is in 7 to 8 fathoms, mud, about half a mile from the shore.

To leave the road by the southern entrance a westerly course may be steered, with the zinc roof bearing 92° true astern, steering for the entrance to the narrows when within about 3 cables of the Pasi coast. Half a mile southward of Padang village the passage is not more than 60 yards broad, and the Pasi coast should be held, leaving it near Tanjong Batu Donkallang, with course 154° true. When the south point of that island bears 242° true the course is 180° true, close eastward of the reef of 3 feet water.

Chart 3616, Tomori gulf to Salayar strait.

Coast.—Southward of the channel between Pasi and Salayar the land is very high, by Lajolo bay it gradually descends to Tanjong Apa-

General charts 3616, 941b, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 30' E.

tana, the south point of the island, a low spit running far out to sea, and ending in a sandbank. The principal villages on the coast are Tiele Tiele, Sengkulukulu, Punaga in Lajolo bay, Biringbone, Pondang, and Baram Barang, in the bay of the same name; southward of the latter the coast becomes rocky, and there are only a few scattered houses.

The most prominent points are Batu Putih and Batu Kerapo; the former is the southern point of Lajolo bay, and consists of white sandstone, very conspicuous with the sun shining on it; Batu Kerapo is steep and rocky; from northward the village Pondang is clearly visible eastward of the point.

Malimbu, 217 feet high, and Guwang, 190 feet, lie near the coast between these points; they are joined by a drying reef, and the passage inside is only fit for boats.

Bylandt reef, with 6 feet water over it, lies about 5 miles westward of Batu Putih, and can be seen by discoloured water; a mile westward of this reef is a small head of 3 fathoms.

The highest point of Guwang islet in line with the hill Baram Barang, 150° true, leads between Bylandt reef and the reefs southward of Pasi.

Bahuluwang, Tambulongan, and Pulassi, near the south point of Salayar, are a subdivision of it, and are governed by a chief who resides in the village Pala, on the east coast of Tambulongan. The islands lie on a large bank, steep-to, near the 100-fathoms line, and consisting of sand, coral, and stones; the water is extraordinarily clear, and the bottom can be easily seen in 12 fathoms. The small wooded islet Namboh Laki (*Lat. 6° 41' S., Long. 120° 17' E.*) lies on the south-west point of the bank; it is uninhabited, but the inhabitants of the larger islands seek for turtle on the extensive drying reef which surrounds it.

A narrow ridge of 2 fathoms least depth, and steep-to on both sides, named Bajan Lamberreh, stretches from Bahuluwang to Tambulongan. Between Tambulongan and Namboh Laki are several shoals of 2 fathoms least water, and about 7 miles northward of the latter island, near the 100-fathoms line, is a shoal of one fathom.

Bahuluwang, with the village of that name on the east coast, is 236 feet high, and is surrounded by a drying reef extending a considerable distance northward, with a detached reef of 3 fathoms lying westward of the north point.

Tambulongan, with the hill Bontoh Kukusang, 725 feet high, in the northern part, is a good landmark from all directions; on this hill, the extremity of a ridge, stands a very conspicuous tree, providing an excellent bearing point, which can be seen from Pasi to

General charts 941b, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 30' E.

Kayuwadi islands. The village Pala, the residence of the chief of the islands, lies on the east coast, and is connected by a serviceable footpath to the villages Limba and Taloh on the west coast.

Pulassi has a conspicuous steep hill, 745 feet high, on the north side, tailing off to the southward with a series of pointed hills gradually decreasing in height. On this island are the villages Ujong, Appa, Limba, and Liang. Both Tambulungan and Pulassi are surrounded by a drying reef, the eastern edge of which lies close to the 100-fathoms line.

The passages between these islands are unsafe and best avoided; with careful navigation, little sea, and a clear sight of the reefs, small vessels may pass over Bajan Lamberreh. The passage between Bahuluwang and Salayar presents no difficulty, and the depths are over 100 fathoms.

For the islands to the southward and eastward, *see* page 317.

The GULF OF BONI, separating the two southern peninsulas of Celebes, is 86 miles wide at its entrance between Tanjong Lassa and the south point of Kabaëna, thence penetrating northward 175 miles. Under the western shore, northward of Tanjong Labua (*Lat.* 5° 21' S., *Long.* 120° 25' E.), lie numerous reefs, the outer limits of which are only partly known; a well-beaconed inner passage runs between them and the coast, used by vessels visiting Sinjai, and from there to Pallima.

Wind and weather.—In the end of April and month of May, at the entrance to the Gulf of Boni, the south-east monsoon blew freshly, with squalls and much rain, swell, and sea; the wind was less more northward, but the rain greater. June and July were very unsettled, with winds from the south-east, but sometimes blowing from westward for several days. In August rain gradually ceased, and the weather became more settled.

Tides.—At Kajang (*Lat.* 5° 19' S., *Long.* 120° 22' E.), on the west side of the Gulf of Boni, the tide is mixed with a preponderating double-daily character, strongest when full and change falls fully 2 days before 0° moon's declination; when the greatest declination of the moon falls fully 2 days after the quarters the double-daily character is least in evidence.

The double-daily tide has springs fully 3½ days after full and change, with high water at IIIh. and a rise of 3 feet; neaps the same interval after the quarters, with high water at IXh. and a rise of one foot.

The single-daily tide has high water, 1st January, at VIIh. 30m. p.m.; 1st April, Ih. 30m. p.m.; 1st July, VIIh. 30m. a.m.; and 1st October, Ih. 30m. a.m.; springs fall 1½ days after the greatest

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Chart 3616, Tomori gulf to Sulayar strait. Var. 2° 30' E.

declination of the moon, with a rise of 2 feet; neaps the same interval after 0° moon's declination, with a rise of half a foot. About the second half of June and December these increase to 3 feet at springs and 1½ feet at neaps, and decrease about the second half of March and September to one foot at springs.

The high waters of both groups cannot fall together; the low waters fall together in the first half of June and December, when the moon's greatest declination falls 2 days after full and change.

Coast.—From Tanjong Lassa to Tanjong Labua the coast is high, steep, and rocky, the 100-fathoms line running a few cables from the shore. The villages Bira and Tiro lie in the bays of the same name; by the latter there is a good landing place. Tanjong Labua is very conspicuous owing to its white rock formation.

There is indifferent anchorage off the small bight Kajang, north of Tanjong Labua, where a Contrôleur resides, but there is no shelter in easterly winds. The coast northward to Tanjong Kopang rises steeply to hills about 400 feet high, but there are no good landmarks except Mount Sinjai.

Boni rock is charted 9½ miles, 64° true, from Tanjong Labua.

Karang Limpogeh is a small sandbank charted in lat. 4° 56' S., long. 120° 45' E. Reefs extend from 2 miles southward of it as far north as the parallel of Bajoa.

Melambiri reef.—The east side of the drying Melambiri reef, 7 miles north of Tanjong Labua, and the 4-fathom patches to southward, named Kalang, have not been examined; between these reefs and the coast are 30 to 40 fathoms. The Mala Mala reefs, to the westward of Melambiri, partly dry at low water. Between the Kajang and Baringang a large number of reefs extend from 2 to 2½ miles from the coast.

Beacon.—A beacon with black cone topmark stands on the north-east point (*Lat. 5° 14' S., Long. 120° 24' E.*) of the Mala Mala reef.

Mount Sinjai, 851 feet high, with a broad flat wooded top, is very conspicuous from Tanjong Labua to the bearing of about 250° true.

Sinjai is the chief place of the Sinjai subdivision, and the seat of a Government official, whose house is conspicuous against the dark green hills. Balangnipa, the old capital, is a well-populated village on the Sungai Tangka, and is connected to Sinjai by a good road. The exports consist of copra, coffee, hides, &c.

The depths in the road decrease gradually, and anchorage may be found in depths of not less than 5 fathoms. There is good anchorage in 11 fathoms, with the mouth of the Sungai Tangka bear-

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Chart 3616, Tomori gulf to Salayar strait. Var. 2° 30' E.

ing about 292° true, fully one mile distant, and the islet Beloppo in line with Mount Chinnung.

Buoy.—A white buoy is moored off the mouth of the Sungi Tangka.

Reefs.—The Malilla and Behulu reefs lie on the south side of Sinjai road; under favourable circumstances the latter can be seen, but the first, with 3 fathoms water over it, gives no indication of its existence. Bunging Kéké lies about 2 miles southward of the island Bulunruwe.

Beacon.—A round stone beacon is erected on Bunging Kéké reef.

Islands east of Sinjai.—Of the nine islands eastward of Sinjai, Bulunruwe, the southern, is the most striking, with its very conspicuous conical hill, 827 feet high, in the southern part, visible in clear weather from Tanjong Lassa to Tanjong Patiro.

Batanlampe appears as a saddle from north and south, the western summit being the highest and most conspicuous. Leangleang has a village on the south-west side. Lanre Lanreang is a small coral island, with some cocoanut trees on it. The remainder have no distinctive features.

Directions for the inshore passage to Sinjai.—From a position one mile eastward of Tanjong Labua the course is 354° true for Bulunruwe, between the Melambiri and Mala Mala reefs, the north-east point of the latter being marked by a beacon. Sinjai hill is steered for when bearing 297° true, passing the beacon on Bunging Kéké reef on the starboard hand and Malilla reef on the port hand; this course leads to the anchorage off the Sungi Tangka.

Coast.—From Tanjong Anchu (*Lat. 5° 2' S., Long. 120° 18' E.*) the coast trends to the northward for 12 miles, and then bends to the eastward to Tanjong Salangketo, forming an unimportant bight southward of the point. From Tanjong Salangketo the coast trends again northward to Tanjong Patiro, an outstretching stony point rising to a hilly ridge immediately behind. Nearly the whole of this part of the coast is edged by a broad drying coast reef, covered with a layer of mud.

The Meru hills, close to the coast midway between Tanjongs Anchu and Salangketo, are two conspicuous summits, 709 and 639 feet high. Mount Pachongi has a conical summit 2,658 feet high. Near Tanjong Patiro are Chinnung, a round hill 822 feet high, and Damara, with a sharp summit wooded with high trees, 495 feet high. The islet Beloppo lies on the coast reef extending from Tanjong Anchu, and the high rocky islet Betah off Tanjong Meru.

Plan of Bajoa roadstead on 2674.

Bajoa roadstead is off the town of Bajoa (Bajowe), and within

General charts, 3616, 941b, 942a, 1263, 2759a.

Plan of Bajoa roadstead on 2674. Var. 2° 30' E.

the outer ridge of reefs, which probably give considerable shelter. The space out to the 5-fathoms line, about 3 miles off-shore, is thickly studded with coral heads. There is a good road to Boni, the chief town of the native state of that name, about 4 miles inland.

Beacons.—A beacon stands on the northern Amelia rock. The fairway to Bajoa roadstead is also marked by three beacons with black truncated cones and three beacons with white ball topmarks. The former are on the north-east end of a drying reef, $1\frac{1}{2}$ miles westward of Amelia rock beacon, on the north side of a drying reef in the inner part of the road, and on the eastern extreme of Torea reef; the latter mark the south-western edge of the Totopela reef; and two small detached reefs westward.

Directions for the passage from Sinjai to Bajoa.—From the anchorage off Sinjai the course is 29° true, rounding the beacon with black truncated cone on Boni Boni reef, south-eastward of Tanjong Anchu, close to on the port hand, and then steering for Betah islet until the islet Beloppo, off Tanjong Anchu, bears 312° true, when course is altered to 32° true for the beacon with white ball on the north-west side of the Tenghai reef (*Lat. $4^\circ 56' S.$, Long. $120^\circ 24' E.$*). If from southward the stone beacon on Bunging Kéké may be left on the starboard hand, steering 359° true to pass between the islands eastward of Sinjai (page 460) and the two beacons with black truncated cones westward of them; when the islet Betah bears 280° true, the course is 32° true to the beacon on Tenghai, as above.

The Two Brothers, white sandbanks, drying at low water, are left close on the port hand, thence between Java bank and close north-westward of the beacon on Tenghai, taking care to avoid a bank of 4 fathoms water $3\frac{1}{2}$ miles, 118° true, from Tanjong Salangketo. When Chinnung hill bears 316° true the course is 3° true, leaving a reef marked by a beacon with white ball on the starboard hand, and Dwars in den weg reef, marked by a beacon with black truncated cone, on the port hand. From abreast Tanjong Pati-ro the course is 356° true, leaving the beacon with white ball on Buginang reef on the starboard hand.

The beacon on the northern of the Amelia reefs is left on the port hand, at about 55 yards distance, with course 290° true, and thence to the anchorage in 5 fathoms.

From northward the passage is between the Torea reef, the eastern extreme being marked by a beacon with black truncated cone, and the Totopela reef, marked by a beacon with white ball on the south-west edge.

Chart 3616, Tomori gulf to Salayar strait.

Pallima.—Anchorage.—Pallima, a trading place of some importance, is situated on the Sungai Chenrana, a short distance from

General charts 3616, 941b, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 30' E.

the coast. In the north-west monsoon there is good anchorage before the Muara Chapia, the central mouth of the river. Provisions can be obtained here.

Buoy.—A black can buoy is moored before the channel to the Muara Chapia.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Pallima every fortnight from Makassar.

Directions.—From Bajoa roadstead to Pallima the course is between the beacons on the Totopela and Torea reefs, and when eastward of the latter, steering for the beacon with white ball on the south side of the Tabako reef (*Lat. 4° 22' S., Long. 120° 26' E.*), thence for the black can buoy off the Muara Chapia, and anchoring in 5 to 6 fathoms.

From Pallima anchorage to northward the passage is southward of the Tabako reef, passing the beacon at not less than 3 cables distance, and maintaining an easterly course until outside the 100-fathoms line, when course to northward may be shaped. By keeping eastward of the meridian 120° 32' E. vessels will pass at least 2 miles outside the reefs between Pallima and Tanjong Loko Loko.

Sungi Chenrana (Chapia) flows from Lake Tempee, about 20 miles inland, in a general south-easterly direction to the sea, where it forms a delta; it has an average breadth of 100 to 140 yards, and at high water levels (in April, May, and June) is navigable for vessels of 4 feet draught to the village Tempee, by the lake. The Muara Chapia kechil is the principal mouth; it is marked by wooden beacons with triangular topmarks, on the starboard side (entering), apex down, on the port side apex up. The least water on the bar at low water springs is one foot. The mouths of the river can only be seen when close under the coast, but Tafelberg, about 9 miles to the westward, is a useful guide.

Coast.—From the Sungi Chenrana to Tanjong Loko Loko, 36 miles to the northward, there are no distinctive features either in the coast or the land behind; a mudbank, occasionally mixed with coral, dries out from one to 2 miles. Numerous reefs lie inside the 100-fathoms line, extending from 4 to 7 miles off-shore, and are marked on the chart; probably more exist, but, as this part of the coast offers few attractions, the wisest course is to give it a wide berth, as described in the directions above.

Northward of Tanjong Siwa the aspect of the land quickly changes, important hills rising near the coast, and a high mountain range further inland. The principal rivers are the Siwa, Bariko, and Jeneh-maëjae, navigable by boats, the depths depending almost entirely on the rainfall. The 100-fathoms line lies about a mile from the coast

General charts 941b, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 30' E.

by Tanjong Siwa, and then gradually edges away, curving to the eastward abreast Tanjong Jeneh across the northern part of the Gulf of Boni.

Mountains.—Latimojong mountains, a gigantic range of nine summits reaching a height of 11,334 feet, run parallel to the coast, about 20 miles inland, but the tops are generally lost in the clouds. Near the coast are Babang hill, abreast Tanjong Babang, and an unnamed conspicuous hill near Tanjong Chimpu. Zadelberg (Labenana), 1,319 feet high, is very conspicuous, and a useful point in making Palopo bay from southward; Walinrang and Beteng are useful marks entering the road.

Reefs.—Lamunre reef, of 2 fathoms water, lies on the edge of the 100-fathoms line $9\frac{1}{2}$ miles, 158° true, from Tanjong Jeneh; it is marked by a black can buoy.

The Bali reefs are a group of thirteen reefs near the edge of the 100-fathoms line, 10 to 14 miles north-eastward of Tanjong Jeneh. Inside these and a little to northward are the Naber reefs and Bron reef. All these dry at low water; the sea in this neighbourhood is much discoloured by the rivers.

Anchorage.—There is good anchorage northward of Tanjong Siwa, in about 10 fathoms; north of Tanjong Polo in 13 fathoms; and north of Tanjong Jeneh in 13 fathoms. The anchorage by Tanjong Polo must be approached northward of Pasi Belongka.

Plan of Palopo bay on 2674.

Palopo bay, in the north-west corner of the Gulf of Boni, is surrounded by mountains decreasing in height eastwards; the rocky islet Libukangeh, 205 feet high, lies on the broad bank extending from the north side of the bay, and stands out clearly against the background. The large town of Palopo (Wara) (*Lat. 2° 59' S., Long. 120° 12' E.*), consisting of about 500 houses, and fully 10,000 inhabitants, is situated on both banks of the Sungai Palopo. A stone pier with a landing stage at the head extends from the right bank of the river out to low water mark.

The best anchorage is in 6 fathoms, but smaller vessels, with local knowledge, anchor closer in, in 4 fathoms; the holding ground is excellent. Labu rock and the smaller reefs northward, two of which are marked by beacons with black truncated cones, somewhat obstruct the entrance.

Communication.—There is fortnightly communication with Makassar by vessels of the Royal Netherlands Steam Packet Company.

General charts 3616, 941b, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 40' E.

Directions.—From Pallima or the southward vessels may steer northward on the meridian 120° 32' E., eastward of Lamunre reef, or approach the coast when abreast Tanjong Loko Loko and steer with a northerly course eastward of Pasi Belongka and westward of Lamunre. Abreast Tanjong Jeneh a north-westerly course may be steered, Zadelberg, the 822-foot hill south of Tanjong Bua, Beteng, and Walinrang, being good landmarks; approaching the road the two beacons and Libukangeh islet will come in sight.

Coast.—The western part of the north shore of the Gulf of Boni is low and flat, the mouths of the streams affording the only landmarks. By the village Saluana (*Lat. 2° 39' S., Long. 120° 42' E.*), a distance of 35 miles from Palopo, ridges from the massive Tampogeh mountains approach the coast, and in the low plain eastward of Sungi Wotu are several scattered hills, the most noticeable being Mount Maliowo, with a sharp peak 1,318 feet high, and Krambua hill, 650 feet high. The Tampogeh mountains have a number of summits assuming fantastic shapes from some directions, but the highest peaks, 9,782 and 8,160 feet, are seldom free from clouds. A drying bank of mud and sand, with occasionally coral, extends for three-quarters of a mile along the entire coast. Between Salu Rongko and Tanjong Terbi the coast is foul to 2 miles off-shore.

Anchorage.—There is good anchorage in 6 to 7 fathoms eastward of the reefs before the mouth of the Sungi Wotu; it is approached by steering for a conspicuous clump of trees near the mouth bearing 326° true. The large village Wotu is about an hour's rowing up stream.

Usu bay is in the north-east angle of the gulf; the southern shore is high and abrupt, the northern is separated from the mountains by an alluvial plain. The wooded islet Bulu Pulu lies off the southern entrance point, the channel between, about 3 cables wide, is safe. The middle of the bay is free from dangers, with depths of 15 to 20 fathoms; the eastern part off the village Lampea is foul.

The Sungi Usu, which discharges in the northern part of the bay, flows from Lake Matanna, and is navigable for large praus to the village Usu, two days' rowing up stream. The town Malili, the station of a Dutch Government official, is situated on the river of the same name, about 3 miles above its junction with the Sungi Usu. A bank of 6 feet at the junction renders the Sungi Malili useless for shipping; from there to the mouth the Sungi Usu is broad, with from 2½ to 5 fathoms water. A bank of one fathom water lies at the entrance, with a channel on either side, the western, with depths of 2 fathoms at low water springs, is buoyed.

General charts 941b, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 40' E.

Vessels should not anchor in less depths than 11 to 12 fathoms before the mouth of the Sungi Usu.

Buoys.—A black conical fairway buoy, with ball topmark, is moored off the entrance to the Sungi Usu; a white conical buoy and a black can buoy mark the western channel to the river.

Coast.—From Tanjong Bulu Pulu the coast runs, with a slight curve inwards, for 38 miles to the southward to Tanjong Tabako, forming numerous small bays of little importance. Depths of 20 to 30 fathoms are found 4 to 5 miles from the coast, and close to there is usually deep water. Between Usu bay and the islet Sapiri (*Lat. 3° 2' S., Long. 121° 3' E.*) a mountain ridge runs close by the coast, and the rocky Tanjong Tolala and the point near Sapiri are conspicuous. This part of the coast is almost uninhabited, Lelewau, in the small bay east of Sapiri, being the only village.

From Sapiri to Tanjong Tabako the coast is low and more populated, the high mountains lying some distance inland. The villages of any importance are Lahou, Pakowé, and Batunon; these consist of 10 to 30 houses, and can be seen from seaward.

Reefs.—From a mile off Tanjong Tabako the 100-fathoms line draws further from the coast for 14 miles, and then bends sharply to westward. Within this depth lie a large number of coral reefs, mostly drying, and of small circumference, many lying close to the 100-fathoms line; they are too numerous to describe here, and the chart should be consulted, but the navigation of the centre of this part of the gulf is inadvisable.

The inshore passage, on a line drawn from 2 miles westward of Tanjong Tabako to the same distance west of Sapiri islet, and thence just outside Bulu Pulu, is safe; if bound for Sungi Usu the passage between the latter islet and Tanjong Bulu Pulu may be taken.

From Sungi Usu to Palopo a direct course may be steered, the most northern of the reefs in the gulf will then generally be seen, as it is always dry.

Coast.—From Tanjong Tabako the coast runs to the southward for 6 miles, to Tanjong Toli Toli, and then turns to the south-eastward to Lariko bay. With the exception of the strip between Tanjongs Tabuso and Labekara, the whole of this part of the coast is steep and rocky, rising immediately to the high mountain land; Susua is the only village.

Between Tanjongs Toli Toli and Batu Laki an almost uninterrupted ridge of drying coral reefs runs at 4 miles and less from the coast; on one of them is a sandbank always above water. The 100-fathoms line runs close along the outer edge of this ridge, but approaches the coast by Tanjong Labekara, where there are no reefs.

General charts 941b, 942a, 1263, 2759a.

Plan of Labuandata bay on 2196. Var. $2^{\circ} 40' E$.

In the small bay Labuandata, 2 miles south-eastward of Tanjong Toli Toli, there is good anchorage, in 20 fathoms, for a single ship.

Chart 3616, Tomori gulf to Salayar strait.

Lariko bay, between Tanjongs Lariko and Waminda, affords good anchorage in about 20 fathoms water on the south side; the shore of the bay is edged by a narrow steep-to reef. Laburoko islet, 400 feet high, lies close westward of Tanjong Waminda.

Tanjong Dungi is steep, and very conspicuous from westward; the islet Champea lies about one mile westward of the point.

Pau Pau bay affords good anchorage on the east side, but is open to south-westerly and southerly seas. A steep coast reef extends from the eastern shore to about 4 cables, and a reef with one foot water over it lies in the north-western part of the bay, 4 cables off-shore.

Reefs.—By Tanjong Lariko the 100-fathoms line turns away from the coast to the westward, and then probably runs along the outer reefs shown on the chart, approaching the coast near the Rosa Marie reef. Until this locality has been thoroughly examined, vessels bound for Lariko or Pau Pau bays from westward should bring Tanjong Dungi on such a bearing as to cross the 100-fathoms line near the Dungi reefs. The above point, bearing 82° true, leads between the two Dungi reefs in 9 fathoms least water.

The following information is known of the outer reefs, for the remainder the chart should be consulted.

The Dungi reefs are two small shoals visible a considerable distance under favourable circumstances; they both lie with the south-west summit of Little Lambasina in line with the highest peak of Padamarang, bearing 121° true. The north-western is circular, about 320 yards in diameter, with a least depth of one fathom. The south-eastern has a least depth of half a fathom; on the ridge between the two are 9 fathoms least water.

Tamboli reef (*Lat. $4^{\circ} 1' S.$, Long. $121^{\circ} 6' E.$*) partly dries at low water, and is plainly visible by surf; 2 miles to the southward is a reef of $4\frac{1}{2}$ fathoms, and there are several reefs between it and Tamboli.

Rosa Marie reef, $12\frac{1}{2}$ miles 268° true from the north-west summit of Great Lambasina, is of considerable extent, breaks heavily, and is estimated to have only a few feet water over it.

BINGKOKA BAY is about 17 miles wide between Tanjongs Kanoweha and Pakar, but a great part of it is inaccessible, owing to the numerous reefs. The islands Lambasina, Padamarang, Kokosan, and Maniang lie across the entrance, south-eastward of the last three the passage is almost barred by reefs and shoals, but between

General charts 941b, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 40' E.

the north shore of the bay and the Lambasina islands is a navigable channel of 20 to 37 fathoms.

Islands in the bay.—Padamarang, the largest island in Bingkoka bay, is mountainous, rugged, and of peculiar shape, forming numerous small bays and conspicuous peaks. The highest summit, near the centre of the island, attains a height of 2,303 feet; from the west it forms a saddle with the north peak, and from southward with the east peak. The north-western hill in the northern part of the island has a conspicuous sharp hillock on its north-eastern slope, and between these is a white stony patch on the coast. The island is mostly surrounded by a very steep reef; the west side is clear, except by the points. The small islet Lima, 236 feet high, lies on the reef which extends half a mile from the south-west point; a bare rock lies on the reef projecting from the south-east point, and the islet Iju lies off the north point of the island. The little island Lemo lies off the east point of Padamarang; the passage between is deep but narrow, and it is not advisable to make use of it on account of the strong current. (Views at page 472.)

Great Lambasina has two summits, forming a saddle; the north-western is 1,053 feet high. Except on the south-west side the island is surrounded by a coast reef projecting 7 cables from the north point in a sharp spit, with deep water immediately outside; the passage between this island and Padamarang is almost closed.

Little Lambasina (*Lat. 4° 5' S., Long. 121° 20' E.*) is low, the highest summit, in the south-west part, being 325 feet; from southward, at about 17 miles distance, it appears as two low separate islands. The passage between both Lambasina islands is about 9 cables broad and clear in mid-channel.

Maniang is an uninhabited island 728 feet high, joined by a drying reef to the islands Low and High Kokosan.

Reefs and beacons.—Padamarang reef is a round coral reef of about 2 cables diameter, dry at low water; it is marked by a beacon with black cone topmark on the south side.

Bingkoka reef, about one cable in diameter, dries at low water springs, and lies 2 miles, 240° true from Kolaka village; it is marked by a beacon with white ball on the north point.

Kolaka reef lies northward of the anchorage off the village, fully half a mile off shore, and is about 3 cables long and one cable broad, drying in parts; close southward of the reef the south point of Little Lambasina is in line with the north point of Great Lambasina. A beacon with black cone topmark stands on its south point.

All the above beacons may be passed at 30 yards distance.

Southward of a line drawn 85° true from the north point of Pada-

General charts 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 40' E.

marang, the bay is so full of reefs that it is advisable not to enter this part, though with rising water and clear sight of the reefs it is possible to enter or leave the bay by the passage between Padamarang and Lemo on one side and High Kokosan on the other.

Westward and southward of the islands, close to the 100-fathoms line, there is a raised ridge, with a flat of 30 to 45 fathoms within; the least water on this ridge is 17 fathoms, 12 miles westward of Tanjong Pakar.

Kolaka.—Anchorage.—There is anchorage in 16 fathoms, mud and sand, off Kolaka village; immediately northward of the village, near the beach, there is a remarkable large dark tree. In the southern part of the village, near the flagstaff of the Dutch Government official, there is a pier 460 yards in length, with a depth of 3 feet at the head. Fresh water can be obtained from a stream near the pier, which can be entered at high water. Provisions are scarce.

Communication.—Vessels of the Royal Netherlands Steam Packet Company visit Kolaka every four weeks from Makassar, calling at ports in the Gulf of Boni.

Directions.—From southward the highest peak of Padamarang can be seen from abreast Tanjong Lamulu (*Lat. 4° 41' S., Long. 121° 28' E.*), keeping it eastward of 0° true will pass outside all dangers. Great Lambasina may be steered for when sighted, and later the south-west summit of Little Lambasina, taking care to keep the latter bearing northward of 332° true, thence passing in mid-channel between these two islands, with course 34° true. When the north point of Little Lambasina bears 250° true, the beacon on Padamarang reef may be steered for, leaving it on the port hand, course then being shaped to pass between the reefs Bingkoka and Kolaka. The south-east summit of Great Lambasina in line with the sharp hillock on the north-eastern slope of the north-west summit of Padamarang, bearing 262° true, astern, leads between these two reefs. (View at page 472.)

From westward the highest summit of Padamarang should be steered for on the bearing 90° true, and then following the above directions.

Coast.—From Tanjong Pakar, which is very steep, the hilly coast runs for 23 miles to the southward to Tanjong Tawari, and is fronted by a reef drying out three-quarters of a mile by Tanjong Tangé Tada, and narrowing to the coast north and south.

A number of small reefs, with depths of one to 5 fathoms, lie within the 100-fathoms line at distances of 1½ to 3 miles off-shore. In the southern half of this part of the coast, and parallel to it,

General charts 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 40' E.

are two large reefs; the northern dries in one part, with depths elsewhere of half to 4 fathoms; its outer edge is steep-to, and lies about $3\frac{1}{2}$ miles from the coast; the southern has three drying parts, with depths otherwise of half to 4 fathoms. The passage between these two reefs and the coast is impracticable on account of the smaller reefs inside.

Mountains.—There are few conspicuous mountains on this part of the coast, but the most noticeable are Mount Pakar, 1,299 feet high; Kamberg, a very high mountain, but situated so far inland that it is not always visible; Begroide hill, fairly conspicuous from northward of Tawari; and Flat hill, of regular height over a considerable distance and dropping rather suddenly at the ends.

Anchorage.—There is anchorage on the south side of the small bay immediately northward of Tanjong Tawari in 20 fathoms, mud, one cable from the coast reef, with that point bearing 199° true. On the south side of Tanjong Tawari, a mudbank, formed by a stream, projects half a cable.

Close northward of the mouth of the Sungi Tawari, which discharges north of the bay, there is anchorage in 12 fathoms, mud, with Tanjong Tawari bearing 175° true.

Coast.—From Tanjong Tawari the coast continues to the southward for 5 miles further to Tanjong Lamulu (*Lat. $4^\circ 43'$ S., Long. $121^\circ 28'$ E.*), and then turns to the south-eastward to Tanjong Buginkali. Along this latter part of the coast there is a very steep and dangerous coast reef, only seen by discolouration in a very favourable position of the sun, a few places dry, and are generally marked by bamboo stakes; by the village Puhara the reef is fully one mile broad. The coast between Sopang bay and Tanjong Buginkali has not been accurately examined.

Pulo Basa is a small, low, thickly wooded, and uninhabited island, lying 9 miles south-eastward of Tanjong Lamulu, surrounded by a large reef drying in parts, extending fully 2 miles to south-eastward, $1\frac{1}{2}$ miles westward, and about 3 cables to northward.

Reefs.—The following reefs, generally seen by discolouration and a heavy surf, lie outside the 100-fathoms line:—

Lamulu, a very steep reef, drying in one part and depths elsewhere of half to one fathom; the drying part consists of clear white sand, and is about 6 feet above water at lowest tide.

Boisebola, 3 miles further south, several parts of which dry, is also steep-to, with depths of over 100 fathoms around.

Sopang, 4 miles south-eastward of Pulo Basa, is a small dangerous reef of 3 feet water. About 3 miles southward of Tanjong Buginkali is a depth of 7 fathoms.

General charts 942a, 1263, 2759a.

Plan of Sopang bay on 2674. Var. 2° 40' E.

Sopang bay affords anchorage for vessels of moderate size, in 8 to 16 fathoms, over sand. The coast reefs, which extend a considerable distance from the east and north shores of the bay, leave but a narrow space of deep water. On the western side of the entrance there is a detached reef of 4 fathoms. Sopang hill, 738 feet high, is situated close westward of the bay.

Chart 3616, Tomori gulf to Salayar strait.

Coast.—From Tanjong Buginkali the coast trends in a general easterly direction to Tanjong Tembuku (Lura), and is little known. The islet Lemu, with a reef projecting east and west, is separated from the coast by a narrow navigable passage of 4 fathoms least depth. A reef is charted about midway between this islet and Tanjong Buginkali, at 2 miles from the coast. On the reef midway between Lemu and Kabaëna there is a least depth of 8 fathoms, according to the natives.

Kabaëna, 12 miles southward of Tanjong Tembuku, is a large inhabited island rising steeply and ruggedly from its western point to a peak 5,758 feet high near the centre, visible from a great distance. The island Mataha lies under the west point, with the low islet Sogori $2\frac{1}{2}$ miles to the southward; the Sogori reef extends 4 miles southward of the latter island; the eastern limits are not defined, but there is known to be a passage of $3\frac{1}{2}$ fathoms depth between it and Kabaëna. The two Telaga islands are off the southern end of the island, and a reef extends $2\frac{1}{2}$ miles to the southward of them, and about the same distance off the west point of Telaga besar.

Vessels have passed through the passage between Kabaëna and Muna, but no directions can be given until this locality has been examined. Kabaëna is reported to lie 7 miles further eastward than charted.

Plan of South point anchorage on 2196

Anchorage (Lat. $5^{\circ} 32' S.$, Long. $122^{\circ} 4' E.$).—There is fair anchorage off the south point of Kabaëna, in 13 fathoms, about 2 miles from the point, with a round-topped hill near the coast in line with Kabaëna peak, 15° true, and the west point of Sindoro island, 327° true.

Chart 3616, Tomori gulf to Salayar strait.

Tioro (Choro) strait, between Celebes and Muna islands, is full of islands and dangers, and without local knowledge the navigation is intricate.

Plan of Lepana islands channel on 2196.

The passage between Lepana islands, eastward of Tanjong Tembuku, and the main coast is entirely clear, with a least depth of 5 fathoms.

General charts 3616, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 40' E.

The passage through Tioro strait is between Marie and Monchelaka islands on the west and Kalangkonak island on the east, then to the northward, steering for Tobalo islet on the bearing 42° true; between Tobalo and Hawa, on a northerly course, keeping the Hawa side; thence about one mile southward of Tanjong Tanene, northward of the reefs west of Great Tobea, and then through the channels either side of that island.

Muna island is about 50 miles in length, with breadths of 15 to 20 miles; little is known of the west and north coasts, except that many reefs extend off them.

South island (Siumpu), 11 miles southward of Muna and westward of Tanjong Mareasaon, the south-west point of Buton, is about 6 miles in diameter, with a table summit of moderate height, formed of stratified rock; there is a conspicuous point on the south-west side, where the coast reef is about one mile broad. Two dangers lie westward of the island, fully one mile from the coast; the southern, reported in 1862, consists of two reefs above water; the northern is charted 3 miles, 16° true, from this.

Kara Tua or Middle island lies about a mile off the north point of South island; the passage between is blocked by reefs.

Chart 3470, Buton strait.

North island (Kada Tua) lies at the southern entrance to Buton strait; a reef extends from the north point, which is sandy with a few cocoanut trees.

BUTON STRAIT, between the islands Muna and Buton, is about 66 miles in length, and in some parts 6 to 10 miles wide, but contracted in two places at the North and South Narrows. The shores are generally high and heavily timbered, with white patches here and there, and precipitous rocks, partly wooded, rising perpendicularly from the water.

Depths are very irregular; in the southern part they vary from 10 to 50 fathoms, in the basin between North and South Narrows over 200 fathoms will be found, and over the northern part 20 to 50 fathoms.

Mountains.—The following summits are the most conspicuous on Muna:—

Castle peak (*Lat. 5° 21' S., Long. 122° 34' E.*), 1,393 feet high, by the southern entrance.

Three hills, 778 feet high, abreast the North Narrows, conspicuous from either north or south.

Castle hill, 527 feet high, behind Lohia bay, conspicuous from northward, and Lohia, 541 feet high, close north-westward.

General charts 3616, 942a, 1263, 2759a.

Chart 3470, Buton strait. Var. 2° 40' E.

On Buton are:—

Bombo, 1,245 feet high, the southern point of a high mountain ridge, but only well seen from northward.

Wooded hill, of 615 feet, abreast Pendek island, can be readily distinguished by its green slopes and wooded top.

Lambolo, 1,496 feet high (view at this page).

Tallo and Klokberg, 1,595 and 1,580 feet high, respectively. Pora Pora hill, 389 feet, not easily distinguished against the high land behind. The summits in the north part of Buton are not very clearly defined.

On Celebes are Tawa Tawaro, 832 feet; Kolono, 1,668 feet, very conspicuous from southward; and a summit (*Lat. 4° 28' S., Long. 122° 45' E.*) of 1,112 feet on Tikola peninsula.

Winds and weather.—In the south-east monsoon, from June to September, it generally blows from south-east, with more or less force, after 10 a.m., and becomes lighter after about 4 p.m.; in some parts of the strait, where the land is high on the Buton side, particularly in South Narrows, very violent squalls occur. In June, July, and August, storms and rains are said to be sometimes experienced; in these months the air was clearer than usual, but in September the wind fell light, with a dense haze over the whole strait. In September and October there was sometimes rain and squally weather over the north part, but fine at the same time in the south; the wind then blowing between north-east and south-east, occasionally extending to north and south. During the north-west monsoons the winds vary between west and north, but there is little rain.

Tides.—The tide is mixed, with a predominating double-daily character, strongest when full and change falls about one day before 0° moon's declination, especially in the second half of March and September.

The double-daily tide has springs 2 days after full and change, with high water at IIh. 30m. and a rise of $4\frac{1}{2}$ feet; neaps fall the same interval after the quarters, with high water at VIIIfh. 30m. and a rise of $2\frac{1}{2}$ feet.

The single-daily tide has high water 1st January, at VIIIfh. p.m.; 1st April, at IIh. p.m.; 1st July, VIIIfh. a.m.; and 1st October, IIh. a.m.; springs fall one day after the greatest declination of the moon, with a rise of $3\frac{1}{2}$ feet; neaps one day after 0° moon's declination with an inappreciable rise. In the second half of June and December these increase to 4 and $1\frac{1}{2}$ feet, respectively, and in the second half of March and September the rise at springs decreases to 3 feet.

The high waters of both groups cannot fall together; the low waters do when full and change falls one day before the moon's

General charts 3616, 942a, 1263, 2759a.

Little Lambasina.

Great Lambasina.

Summit bearing 2° true, 13 m.

Maniang.

Padamarang.

Gulf of Boni; Bingkoka bay, islands.

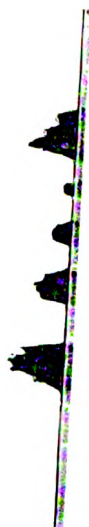
Tanjong Pakar.

N.W. summit of Padamarang. S.E. summit of Great Lambasina. N.W. summit of Padamarang. Lambasina. summit.



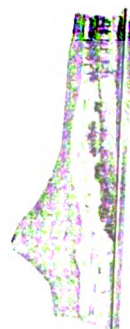
White stone patch. Iju. Little Lambasina. S.E. summit of Great Lambasina in line with hillock in Padamarang, bearing 262° true.

Bingkoka bay.



Pulo Lima, bearing 301° true, 1 m.

Buton strait.



Lambolo in line with the E. point of Kuthalipana, bearing 118° true.

Buton strait.



Japara isld.

Bang isld, bearing 211° true, 4 m.

Chart 3470, Buton strait. Var. 2° 40' E.

greatest declination, about the middle of June and December, at VIIIh. p.m. and VIIIh. a.m.

The flood stream enters the strait from north and south, meeting near Tampenan Bale; the ebb runs outwards in opposite directions. The greatest rate is 5 knots, in South Narrows, in other parts varying from one to 3 knots. In the narrow parts violent eddies and counter currents necessitate great care and watchfulness. Slack water lasts a very short time.

Plan of South Narrows on 3470.

Buton (*Lat. 5° 28' S., Long. 122° 37' E.*), the only town of any importance in the strait, is situated on the mouth of a small stream half a mile eastward of Tanjong Putih, the south entrance point; the Sultan resides in a fort a short distance up the river.

There is very good anchorage eastward of the mouth; when there are other vessels in the road it is advisable to moor to avoid collision when swinging at slack water. The coast reef dries out to about 2 cables off the town.

Light.—A *red fixed* lantern light is exhibited, at 10 feet above high water, from a post on the eastern end of the landing pier at Buton.

Supplies, such as eggs, fowls, and fruit, can be obtained in small quantities. Water, from the river, which is always accessible for boats, must be brought down from a considerable distance. There is no coal.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Buton every four weeks from Makassar to Gorontalo, both outward and return.

South Narrows.—The Muna coast, between Tanjongs Pangela and Barū Baru Koma, is rather low, and a reef projects half a mile in parts. Tanjong Kalandria, the eastern point of Kalandria bay, is low and wooded; a reef extends 4 cables to the south-westward of the point, off which there is good anchorage in 10 fathoms. Tanjong Barutu is a low green wooded point, sharply defined when seen against the opposite shore. The village Lambako, northward of the point is on a plateau rising steeply from the sea; the coast here becomes very high and steep.

Chart 3470, Buton strait.

The east shore of the narrows, between Tanjongs Putih and Papremkama, forms a large circular bay, in which lies the island Makassar, heavily timbered in the southern half. The coast between Tanjongs Papremkama and Kalankangan is steep and precipitous. Immediately southward of Tanjong Batu Sori is the islet of the same name, composed of a high mass of sandstone, wooded above; Batu Kapal islet, abreast Tanjong Kalankangan, rises steeply from the water, the under part is eaten away by the strong current.

General charts 3616, 942a, 1263, 2759a.

Chart 3470, Buton strait. Var. 2° 40' E.

Buton strait, between North and South Narrows.—

The west shore is high and steep. Kemba bay, between Tanjongs Kemba and Mata Ajer (*Lat. 5° 13' S., Long. 122° 37' E.*), runs about 3 miles inland; about 5 miles northward of the latter point is a conspicuous wooded hill, well defined against the bare land behind.

On the east side the coast becomes low, with the wooded islands Pegate and Pendek, and beyond these is again high and steep. Northward of Tanjong Umbulu Suan is a round-topped tree on the slope of a ridge, only conspicuous from southward. Gosong Kulaga consist of a number of shoals of sand and stone, separated by depths of 3 to 10 fathoms; at low water two parts show, white in colour, and one of them dries 6 feet. Tanjong Tampenan Bale, the extremity of a long tongue of land, is fringed by a narrow reef, and there is good anchorage near in 8 to 10 fathoms.

Plan of North Narrows on 3470.

North Narrows.—The west shore continues high and steep. Bali reef, of $2\frac{1}{2}$ fathoms, lies on the western side of the channel, 7 cables off-shore; Banka reef, of $2\frac{3}{4}$ fathoms, lies further northward, and a mile from the Muna coast. The Dua islets lie on a detached reef of 3 feet least water, between Banka and the coast of Muna. The Lima islands lie to the south-eastward of Cape Haai, and consist of five bare rocks, the southern and largest being green in colour and very conspicuous from southward (view at page 472). A small reef of 3 fathoms lies 2 cables to the north-eastward of Cape Haai. There is good anchorage in Lohia bay.

On the east side, northward of Tampenan Bale village, the land is high and densely wooded, and this continues so over all the north part of Buton. Kaholipana island is covered with tall trees, many of them dead, and showing white, bare trunks. Lebutan and Puning islands are low and wooded, the former surrounded by a broad reef with a high rock on it.

Chart 3470, Buton strait.

Northern part of the strait.—The west shore, from Lohia bay to Tanjong Lambiko, is low and wooded; it is fronted by a broad coast reef, with several detached reefs, although too near the shore to be of any danger to shipping. The entrance to Tioro strait (page 471) is between Tanjong Lambiko and the high Tikola peninsula, on either side of Great Tobea island. Kolono bay, between Tikola and Tanjong Kolono, penetrates inland 10 miles, with depths of 11 to 18 fathoms. The east shore, between Tanjong Gornea and Labuan Blanda, is low, trees and mangroves growing to the water's edge; by Tanjong Gornea the coast reef extends half a mile, and a small river discharging here discolours the water of the strait for a considerable distance.

General charts 3616, 942a, 1263, 2759a.

Plan of Labuan Blanda on 2196. Var. 2° 40' E.

Labuan Blanda is a high wooded island near the coast of Buton; on the surrounding reef, which extends 2 cables on the north side, are two rocks above water. There is good anchorage (*Lat. 4° 27' S., Long. 122° 56' E.*) south-westward of the island, in 8 to 10 fathoms, close to the shore.

Chart 3470, Buton strait.

Between Labuan Blanda and Tanjong Buton the coast is very high and steep.

DIRECTIONS. — Approaching Buton strait from southward or westward, the high land of Kabaëna, the Telaga islands, North, Middle, and South islands, and Castle peak, are all good marks for the entrance, which is between Tanjongs Pangela and Putih.

Nearing the entrance, the middle of Makasser island, which will be seen between the above points, may be steered for on the bearing 56° true, between the reefs projecting from both entrance points. When a house with zinc roof on the east bank of the river (the first house with zinc roof from westward) is in line with the Sultan's house (high up towards the mountains) this mark is held astern with course 7° true, passing between Tanjongs Baru Baru Koma and Papremkama in not less than 10 fathoms water. When the latter point bears 135° true course is altered to 42° true, steering for Tanjong Kolakana, and for Batu Sori islet when Batu Kapal opens out clear from the west shore of the narrows. When the narrows are entirely open a mid-channel course is held until abreast Batu Kapal, when course is 14° true; as soon as the north point of Pegate island bears 90° true, the middle of the Three hills may be steered for on this same course; this leads 1½ miles west of Gosong Kulaga. When Tanjong Tampenan Bale is in line with Mount Lambolo course is 45° true for the north-west side of Kaholipana island, and 16° true when the south side of that island bears 90° true. On this course Mount Lambolo will come in line with the east point of Kaholipana, bearing 178° true (view at page 472), and is held astern with course 358° true, leading eastward of Banka reef and clear of the coast reef by Tanjong Labunea; thence by sight out of the strait.

Chart 3616, Tomori gulf to Salayar strait.

East and south coasts of Buton.—Tanjong Buton, the north point of the island, may be safely approached, but the east and south coasts of Buton are imperfectly known, and caution must be exercised when navigating in this vicinity. Reefs exist in the bay immediately southward of Tanjong Buton, and a large reef, marked by discoloured water and breakers (the eastern end of which is defined on the chart), extends over 4 miles from the coast midway between this bay and Tanjong Goram.

General charts 3470, 3616, 942a, 1263, 2759a.

Plan of Kali Susu anchorage on 2196. Var. 2° 40' E.

Kali Susu (Dwaal bay), the large bay between Tanjong Goram and East point, affords anchorage in the northern part, between Tanjong Goram and Kapula (Hook island). Steering into the bay three remarkable trees on the eastern high land behind will be sighted; by keeping the eastern of these on the bearing 14° true a sharp point of land will be observed on that bearing, and anchorage in about 40 fathoms may be picked up about a mile from the point, with the islet off the south-east point of Kapula bearing 228° true, and a little over 1½ cables south-eastward of a small detached reef. Further to the northward, where the village Kali Susu lies, there are numerous dangers.

Chart 3616, Tomori gulf to Salayar strait.

Reefs.—Two reefs, stretching in a west-north-west and east-south-east direction, lie nearly in the middle of Kali Susu; the eastern of these is about 10 miles southward of Tanjong Goram.

Innocenti reef.—In 1891 the Italian ship *Innocenti* reported striking a coral reef with Tanjong Goram (*Lat. 4° 51' S., Long. 123° 11' E.*) bearing 295° true, distant 8 miles.

Coast.—From East point the coast trends to the south-westward for 19 miles, to the extremity of a low tongue of land, the north-east point of a bay in which no bottom at 30 fathoms was found one mile off-shore. A reef extends one mile from the high south-west point of this bay.

Penguin reef, reported in 1873, was described as lying 6 miles from the south-east coast of Buton, and as extending 9 miles in a north-north-easterly direction, with 1½ fathoms least water on the south end. No bottom was found at 120 fathoms a short distance from this spot.

The south coast of Buton is high; there is anchorage in about 28 fathoms in the inner part of the two deep bays on this coast.

Batu Atas (Hagedis island), 27 miles south of Buton, is of moderate height; the west side is steep, the east low and wooded, reefs extend off both these sides for 2½ miles. The two Lagu rocks lie off the south side.

A reef is reported by the S.S. *Waerwijck*, about 5 miles, 144° true, from the south-west point of Batu Atas; it is about half a mile in extent, and marked by breakers and discolouration.

A doubtful reef is marked on the chart about 10 miles to the southward of Batu Atas.

Six-foot bank.—The western edge of this bank lies about 7 miles eastward of Batu Atas, but probably it does not extend to the eastward as far as the chart shows. In 1882 the Dutch man-of-war *Banjermasin* passed this vicinity along the meridian 123° 5' E. without seeing any trace of it or the bank charted to the southward.

General charts 3616, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 40' E.

BUTON PASSAGE, between the south-east coast of Buton and Batu Atas and the Tukang Besi islands, is usually followed by vessels from Salayar strait. There are no known dangers in the passage, except a reef of 3 fathoms in the western entrance, 11 miles southward of South island, but of which the existence is doubtful.

Directions.—Ships bound westward in the south-east monsoon should steer for the northern of the Tukang Besi islands, and round it within 3 or 4 miles, as some ships, by steering wide of these islands, have been unable to weather or beat round the south end of Buton against the northerly currents which at times prevail, and have been obliged to proceed through Buton strait. With westerly winds vessels from Salayar strait should close the south-east point of Buton to about 3 miles, and keep along the coast as far as East point to prevent being set over towards the Tukang Besi islands and reefs in the light airs and southerly currents which frequently prevail in the offing.

Chart 942a, Eastern archipelago, eastern portion.

TUKANG BESI ISLANDS form an extensive archipelago, 86 miles in length in a north-westerly direction, and 40 miles wide; the islands are of moderate height, with numerous dangers outside and between them, of which very little is known.

Chart 3616, Tomori gulf to Salayar strait.

Wangi Wangi, the north-western and largest of the group, lies, with several other islands, on an extensive reef. The island is hilly, in the north-west part attaining a height of 898 feet.

A very steep drying reef surrounds the entire island, projecting a half to 3 cables on the north side, and stretching far out to the west and south-eastward; several islands lie on this reef, the largest being Kamkode and Kompanaune. In some water spaces enclosed by the reef are relatively great depths, and on the south-west coast there is a large loch with depths of 8 fathoms. On the north and east sides of the island a narrow barrier reef, drying off the north coast, and with depths of one to 6 fathoms over the remainder, runs parallel to the coast reef at one to 3 cables distance, forming a channel between with 17 to 25 fathoms water. It was probably on the drying west point of this reef that the *Judä Reitz* struck in 1877.

Both Wangi Wangi and Kamkode are inhabited, but the population is very scattered, and there are no proper villages; they are under the authority of the Sultan of Buton.

LIGHT (*Lat. 5° 15' S., Long. 123° 33' E.*).—A white flashing light every five seconds, is exhibited, at an elevation of 492 feet, from a white iron framework 69 feet high, situated on the north-west point

General charts 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 50' E.

of Wangi Wangi. The duration of the flash is *four-tenths of a second*. It is visible from a distance of 28 miles. For limits of visibility, *see* Light list.

Anchorage.—Between Kamode and Wangi Wangi the reef forms a deep bight, with anchorage in the south-eastern part in 25 to 30 fathoms, coral, the east point of the island in the middle of the bight, bearing 137° true, and the highest part of Wangi Wangi in line with a conspicuous tree, 32° true; this position is abreast a group of houses on Wangi Wangi, and a similar group on Kamode.

Batu Kamode, 9 miles south-westward of Kamode, is the north - west drying part of a large reef, extending south-eastward as far as could be seen; there are depths of over 100 fathoms a very short distance from the north-west point. Reefs extend from here to abreast Binonka, but the passage between Batu Kamode and Kamode is reported clear.

Chart 942a, Eastern archipelago, eastern portion.

Kaledupa islands lie to the south-eastward of Wangi Wangi; there is said to be a 2½-miles wide passage between these islands and Kompanaune, which can be clearly seen by the colour of the water.

Tomia, 11 miles further south-eastward, is about 5 or 6 miles long and 1,116 feet high; according to the natives there is a very wide and clear channel between it and Kaledupa.

Lintea, about a mile south of Tomia, is 197 feet high, and closely overgrown; on the south-west side, connected by a reef, is the little islet Tongowoho (*Lat. 5° 49' S., Long. 123° 53' E.*).

Binongka, 6 miles south-eastward of Tomia, consists of raised terraces of coral reaching a height of 723 feet; the bordering reef is everywhere steep-to, and varies from 70 to 270 yards broad. Besides a number of scattered houses there are at least six villages on the island, Talu, Popaliha, and Taipabu, on the west coast, Palahidu on the north coast, and, according to the natives, Wali and Drokuwa on the east coast.

Anchorage.—There is temporary anchorage for a moderate sized vessel off the entrance of a creek in the reef, which runs in a west-south-west direction towards the village Palahidu on the north coast. The space being limited, one anchor should be in 20 fathoms outside, and a second in 10 fathoms at the mouth of the creek.

Reefs.—At a distance of 8 to 19 miles westward of Binongka are two large, partly drying, coral reefs; the western of these is 5 miles long in a north-westerly direction, and 3 miles broad, the eastern is 5½ miles long in a north-easterly direction, and 2 miles broad. Inside these, 6 miles west of Binongka, is a smaller reef, which also partly dries. These reefs are all plainly marked by discolouration.

General charts 942a, 1263, 2759a.

Chart 942a, Eastern archipelago, western portion. Var. 2° 50' E.

Kaka reef is an atoll with an opening 160 yards broad on the north-east side, and drying sandbanks along the north side; it lies about 12 miles east of Binongka, but its exact position and extent are uncertain.

Moro Maho, or Veldhoen island, is low, wooded, and, except on the west side, surrounded by a reef, on which the surf breaks heavily; on the east side is a white strip of land which might also be mistaken for breakers from a distance. The island is visible about 16 miles. Its position is doubtful, but the Dutch Sailing Directions of 1912 state that it is in lat. 6° 12' S., long. 124° 39' E.

Keuti Olo, 28 miles north-eastward of Binongka, is described as about 3 miles in extent, well wooded, and surrounded by a reef to a distance of 2 miles; it can be seen 10 miles off.

Chobo Chobo, 11 miles to the south-westward, is also thickly wooded.

St. Matthew islands (Langkesi), the north-eastern of the archipelago, are two thickly wooded islands on a large reef on which the sea breaks heavily; the southern island is visible from a distance of 20 miles.

Emperor of China and New Rock.—Two small reefs are marked on the chart southward of the Tukang Besi islands, but nothing certain is known of them; Emperor of China (*Lat. 6° 45' S., Long. 124° 16' E.*) was reported in 1852, and New Rock, 25 miles further to the eastward.

Reef.—In 1862 discoloured water was seen north-eastward of the Tukang Besi islands, in lat. 4° 12' S., long. 124° 43' E.; immediately afterwards soundings of 30, 40, and 60 fathoms were obtained.

Chart 3616, Tomori gulf to Salayar strait.

EAST COAST OF CELEBES.—Wowoni island is lofty towards the centre, rising gradually from the sea to a height of 1,767 feet. Wowoni hill, 743 feet high, is a useful landmark in the southern part of Wowoni strait; from northward the two summits of the Wowoni mountains are more conspicuous. The western coast is low, and many small streams discolour the water so as to hide the reefs from view; the east coast has not been examined. The population of the island is about 4,000.

Plan of Wowoni strait and channel to Kendari bay on 2196.

WOWONI STRAIT, between Wowoni island and Celebes, is 15 miles in length and about 4 miles broad; the eastern side, especially towards the south entrance, is so studded with dangerous reefs that only a narrow passage near the western shore is available for safe navigation.

General charts 3616, 942a, 1263, 2759a.

Chart 3470, Buton strait. Var. 2° 50' E.

Red cape, on the Celebes side, is bare, rises abruptly from the sea, and by its colour is easily seen; the shore northward is high and steep.

Plan of Wowoni strait and channel to Kendari bay on 2196.

Steile cape can be easily recognised from north and south by two rounded summits just behind. High rock, one mile to the southward and half a mile off-shore, forms a good mark for navigating the strait.

West Tweeling reef, with 2 fathoms water, lies in the fair-way, $1\frac{1}{4}$ miles north-eastward of Steile cape; it consists of two coral heads, one cable apart, with 16 fathoms between.

The dangers blocking the strait, eastward of West Tweeling reef, are best seen by the chart.

Buoy.—A white conical buoy is moored on the western side of West Tweeling reef.

North and South Champada are two low wooded islands under the Celebes shore, with a deep channel between; the former consists of two parts joined by a reef drying at low water. Both islands are surrounded by a very steep reef, narrow on the western sides.

Beacon.—A beacon, with black cone topmark, is on the south-east point of the reef extending from South Champada.

Two Brothers (*Lat. 4° 8' S., Long. 122° 54' E.*), a mile northward of Champada islands, and connected to the land by a reef, are wooded rocks about 50 feet high.

North reef is small, with 3 fathoms over, and is the only danger in the north part of the strait; it is in mid-channel, $3\frac{1}{4}$ miles, 12° true, from the outer Brother.

Tanjong Laonti, the north-west extreme of the strait, is very steep; Mount Laonti, 1,973 feet high, is from some directions a very conspicuous object.

One and a half miles off Tanjong Pakaleang, at the north-east end of the strait, there are two rocks with a half and one fathom water.

Islands and dangers north-west of Wowoni.—From Tanjong Pamali, the north point of Wowoni, a ridge of reefs, broken here and there, extends westward for 25 miles to the entrance of Kendari bay; a large portion in the neighbourhood of the Puluhari banks, is not fully examined, and new reefs continue to be reported.

Taka Langarang is an extensive drying reef extending 3 miles westward of Tanjong Pamali, and probably connected to the Wowoni coast.

East bank, $1\frac{1}{2}$ miles south-westward of Taka Langarang, consists of several isolated patches of $2\frac{3}{4}$ fathoms least depth, and 7 fathoms

General charts 3616, 942a, 1263, 2759a.

Plan of Wowoni strait on 2196. Var. 2° 50' E.

between. Middle bank, 3 miles further westward, is steep-to on all sides, with a least depth of $2\frac{1}{2}$ fathoms. West bank, 3 miles further, and of $2\frac{1}{2}$ fathoms least water on the western extreme, is also steep-to. The channel from Wowoni strait to the northward is between West bank and Lingoro reef, 3 miles to the westward.

South Saponda, one mile northward of Tanjong Laonti, is covered with high trees, visible from a great distance; a small reef lies 2 cables, 242° true from the island, and just dries at low water springs. At distances of 3 miles, 280° true, and $4\frac{6}{10}$ miles, 285° true from South Saponda, are two small reefs of one fathom water.

Middle Saponda (*Lat. $3^\circ 59'$ S., Long. $122^\circ 46'$ E.*) is low, with several tall trees on it; it lies on a large reef extending $1\frac{1}{2}$ miles east and 3 miles westward. Puluhari banks, 4 miles long east and west, and drying in places, lie midway between South and Middle Saponda.

Sappa Jambi bank is about $2\frac{1}{2}$ miles in length; a small part near the centre dries at low water.

North Saponda, 12 miles to the northward of Tanjong Laonti, is a low island covered with high trees; North Saponda reef runs about 3 miles to the westward, the west end being on the line, Tanjong Laonti touching the east point of Middle Saponda. Between this reef and the coast reef extending from Tanjong Nipa Nipa, there is a channel about 4 miles wide, in the southern part of which a reef, with little water over it, lies $4\frac{3}{4}$ miles, 245° true, from North Saponda.

Chart 3470, plan on 2196.

Directions.—From Buton strait the Celebes coast may be held at a short distance until past High rock; the extreme of Red cape, then touching the inner side of High rock, bearing 180° true, will lead one cable west of the buoy marking West Tweeling reef, and close east of the beacon on the south-east point of South Champada reef; both the reefs are generally shown by discolouration.

Champada passage, between the islands and Celebes, is safe and clear of dangers; the course is mid-channel, the least depth 13 fathoms, and the narrowest part, at the north entrance, is 328 yards across. In the western monsoon violent squalls sometimes blow very suddenly from the mountains of Celebes, and may completely obscure the land; in such weather this inner channel is not recommended.

Approaching the south entrance of Wowoni strait from eastward, High rock should be steered for bearing northward of 272° true, until the highest part of North Champada is 339° true; then on to the leading mark in.

Passing out of the strait northward, the course from Toro Pemali is 355° true, towards North Saponda island, until South Saponda is

General charts 3616, 942a, 1263, 2759a.

Plan of Wowoni strait on 2196. Var. 2° 50' E.

in line with Tanjong Laonti, then 299° true, and out westward of North Saponda reef, with South Saponda touching the east side of Middle Saponda. Bound eastward, then from the point of the course 355° true, where Middle Saponda bears 272° true, Manui island should be steered for, until clear of the chain of reefs encumbering the north-east approach of the strait, which extend 10 miles westward of the north point of Wowoni island.

Staring bay, between Tanjongs Laonti and Wowobatu, is of considerable extent, but has not been examined.

KENDARI BAY.—From Tanjong Wowobatu the coast curves in, forming a funnel-shaped bay, with the island Nambo lying in the inner part. The shores of this inlet are fronted by a broad coast reef, on the northern of which lies the low islet Bakori, showing distinctly against the land behind.

Kendari hill, on the south side, 694 feet high, with a remarkable tree north-eastward, is very conspicuous; Mount Staring, 1,702 feet high, on the west side of Staring bay, is also a prominent peak, but Mount Nipa Nipa, 1,835 feet high, northward of Kendari bay, does not show a very distinct summit.

Northward of Nambo is a narrow, winding, but deep passage, forming the entrance to Kendari bay. This passage has a least breadth of 165 yards, and is not readily distinguished, but the reefs on either side of the entrance are clearly seen. The passage southward of Nambo dries at low water in the eastern part, and at high water is only navigable for small vessels.

Kendari bay runs into the land to about 4 miles westward of Nambo, gradually increasing in breadth, but a broad mudbank fills the inner part. The bay affords fine anchorage, the high surrounding land sheltering it from all winds; the northern shore is steep, the southern flatter, but densely wooded. Several streams discharge into the bay, the principal being the Laepo Laepo, where boats can obtain fresh water at high tide. The town of Kendari (*Lat. 3° 58' S., Long. 122° 35' E.*), the residence of a Dutch Government official, lies in an inlet on the north shore of the bay, near the entrance; there is anchorage here in 8 to 10 fathoms. The south shore of the bay, opposite the town, must not be closely approached, as reefs extend out one to 2 cables.

The climate is healthy; from April to August the minimum temperature was 70° Fah., and the maximum 89° Fah.

Tides.—The range of tide varies from 3½ to 8½ feet.

Beacons.—The channel from Wowoni strait to Kendari bay is marked by two black cone beacons, on the south side, and four white

General charts 3616, 942a, 1263, 2759a.

Plan of Wowoni strait on 2196. Var. 2° 50' E.

ball beacons, on the north side. No. 1, black, is on the north edge of the small reef $1\frac{1}{2}$ miles east of Tanjong Wowobatu; No. 2, black, on the north edge of the detached reef, 2 miles east of Nambo island. On the north side, No. 1 white beacon is on the south end of the small reef southward of Sappa Jambi bank; Nos. 2 and 4, white, on the south-west and north-west sides of Sappa Jambi; and No. 3 on the edge of the coast reef projecting from the northern side of the entrance to Kendari bay. No. 4 beacon has two white balls, one under the other.

Directions.—From Wowoni strait to Kendari bay, the route is southward of South Saponda island, and of the great flat upon which Middle Saponda and Puluhari banks stand. Passing Toro Pemali at about 3 cables distant, and midway between South Saponda and Tanjong Laonti, Kendari hill may be steered for with course 283° true; when North Saponda opens west of South Saponda steer between the black cone beacons on the south side and the white ball beacons on the north side of the channel, taking care to avoid the reef of one fathom water nearly midway between No. 1 beacons, and turning towards the entrance of the bay, when Kendari hill is in line with the summit south-westward, which is 1,619 feet high. Passing through the narrow part westward of Nambo island, the northern shore, towards the village of Kendari, should be held to, in order to avoid the reefs off the south side.

Bound northward from Kendari, steer for No. 4 white beacon until No. 2, black, is in line with Tanjong Wowobatu, thence 67° true between the bank extending from Bakori and No. 4 beacon; this beacon must not be passed at less than one cable distance. Then proceed out westward of North Saponda reef, with the west side of South Saponda touching the east side of Middle Saponda.

Coming from northward, the leading mark, west side of South Saponda touching the east side of Middle Saponda, 170° true, must be on before Tanjong Nipa Nipa is approached, and the course 247° true can be steered when the north side of Bakori island is 264° true.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Kendari (*Lat. $3^{\circ} 58' S.$, Long. $122^{\circ} 35' E.$*) every four weeks from Makassar to Gorontalo and back.

Chart 3616, Tomori gulf to Salayar strait.

Coast.—From Tanjong Nipa Nipa to Salabangka strait the coast is very broken, and forms three bays, Lasolo, Matarapi, and Tampa-

General charts 3616, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 50' E.

kura. The land in the interior is very lofty, with many rugged peaks, generally enveloped in clouds, and only seen after heavy rains in the north-west monsoon. The most noticeable mountains near the coast are Buldung, 965 feet high; the highest peak of the Lasolo mountains, 2,785 feet; and the hills on the islands Bahulu, Labengki, Van Leuwen, and the Matarapi group.

In the southern part of Lasolo bay, within the line joining Pulo kechil (*Lat. 3° 39' S., Long. 122° 14' E.*) and Wooded hill, to the south-eastward, lie numerous reefs, making that part of the bay unsafe.

Chart 3148, Salabangka strait and approaches.

The only river of any importance on this part of the coast is the Sungi Lasolo, that discharges with three mouths abreast Bahulu island; a steamboat can reach the village Lasolo, about 16 miles up stream. Lasolo carries on a brisk trade with Salabangka and Kendari, the goods being shipped in large praus.

Labengke lies off the high peninsula separating Telok Dalam and Matarapi bay, with a clear passage between, both sides of the strait rising steeply from the sea. The Matarapi islands, lying across the entrance to Matarapi bay, consist of three large and several small islands, with several reefs in the vicinity.

Reefs.—A great number of reefs (which continue to be reported) lie in the three bays mentioned above, and the chart must be referred to for these. The following dangers lie near the track of vessels bound for Salabangka strait:—

Chart 3616, Tomori gulf to Salayar strait.

South reef, of 2 fathoms least water, and great depths around, lies with Tanjong Nipa Nipa in line with the highest summit of the Pemali range, 12 miles from this point and $4\frac{1}{2}$ miles off-shore.

Chart 3148, Salabangka strait and approaches.

At a distance of about 9 miles, 119° true, from the summit on the east point of Bahulu is a shoal of 2 fathoms, mud; to the eastward and southward of this shoal four isolated reefs were seen (in 1910), one of them, lying one mile to the south-eastward of the shoal, was marked by surf, and the depth was estimated at $1\frac{1}{2}$ fathoms. Middle reef, of one fathom water, lies $6\frac{1}{2}$ miles, 98° true, from the same summit; North reef, also of one fathom, lies $4\frac{1}{2}$ miles northward of Middle reef.

De Haan reef, of sand and coral, with a least depth of one fathom over it, lies $2\frac{1}{2}$ miles eastward of Labengke.

General charts 3616, 942a, 1263, 2759a.

Chart 3148, Salabangka strait and approaches. Var. 2° 50' E.

South bank, $2\frac{1}{2}$ miles northward of De Haan reef, is $1\frac{1}{2}$ miles long, and has a small sand shoal near the north part, partly dry at high water; on the east side of it is a beacon with black cone, No. 1.

Serdang rock (*Lat. 3° 23' S., Long. 122° 30' E.*), of 3 feet water, $2\frac{1}{2}$ miles further northward, is separated by depths of over 17 fathoms from the Serdang reefs, which extend over a length of 3 miles; the eastern edge of these reefs has not been examined.

North bank, a small reef with stones, and 3 feet least water, lies 5 miles eastward of the north extreme of Labengke; a beacon with black cone, No. 2, marks the eastern side. In 1912 a drying reef was reported $1\frac{1}{2}$ miles north-westward of the beacon.

About $1\frac{1}{2}$ miles, 85° true, from the south-east point of the southern Matarapi island, is a reef with little water over it (reported 1911), and 2 miles to the southward of Van Leuwen island are two reefs of 2 and one fathom water.

South Hinder, a small, round, stony reef drying at low water, lies $2\frac{1}{2}$ miles eastward of Van Leuwen island; a beacon with white ball, No. 1, marks the western side. Pas-op reefs, to the south-eastward, also dry at low water.

North Hinder, about $1\frac{1}{2}$ miles, 340° true, from South Hinder, has 2 fathoms water over it; one mile further northward is a reef about $5\frac{1}{2}$ cables in length.

Tides.—The greatest range of tide, in this neighbourhood, was $6\frac{1}{2}$ feet, and the currents were in some places strong.

Manui island.—From Pulo Dua, 4 miles east of Van Leuwen island, there extends for 45 miles east and south-east, a broad chain of reefs and islands, dangerous to approach by both steam and sailing ships. Some of these islands are merely sandbanks covered with low shrubs, such as Pangajarang and Kokoila, others, such as Samaringa and Luna Sualu, are thickly timbered; Padea besar and Padea kechil are low, partly-wooded islands. They are all uninhabited, and there is no known anchorage amongst them. Manui, the south-easternmost island, is inhabited and fertile; there are also buffalo and goats on it. It is surrounded by a very steep-to reef, which is broad on the north and north-west sides.

The limit of safe navigation northward of these islands, is the summit of Van Leuwen island in line with the north side of the south-eastern Pulo Dua, bearing 272° true; and to southward, the peak of Labengke bearing 272° true, until Samaringa island is 334° true. No dangers were seen between Manui and Wowoni.

Directions, from Kendari bay to Salabangka strait.—From the position on the leading mark—west side of South Saponda in line

General charts 3616, 942a, 1263, 2759a.

Chart 3148, Salabangka strait and approaches. Var. 2° 50' E.

with the east side of Middle Saponda—with North Saponda bearing 92° true, the course is 333° true for the summit of Van Leuwen island, and when near De Haan reef the beacon on South Bank will be seen. The beacon then in line with the east side of Van Leuwen island, until the peak of Labengke is open north of De Haan island, will clear De Haan reef; and, passing eastward of South and North beacons (at not less distances than half a cable), these should be brought in line until the white beacon on South Hinder is passed on the starboard hand, the course then is 23° true, eastward of North Hinder reef, until the beacon on General Pel reef is in line with the hill on Toko Aja island.

SALABANGKA STRAIT from Tanjong Tapoa-uluna, the south point, runs about west-north-west for 16 miles, then turns abruptly north-east for nearly 8 miles. In the ship channel the water is deep, but in the north-west part off the end of Tampanbaleh island, reefs from either side narrow the passage to 4 cables, and the tidal streams run through with considerable force.

Beacons and buoy.—The strait is marked by a black beacon on the south side, and two white beacons on the north. Also by a red buoy on a reef in mid-channel.

Adder reef, in the southern fairway, nearly 2 miles eastward of Tanjong Tapoa-uluna, has a depth of over 2½ fathoms. The beacon on General Pel reef in line with the summit of Toko Aja island leads westward; Tanjong Baja open north of Panjilili passes northward; and the extremes of Tanjong Togotonona and Tanjong Baja, touching, leads over the south edge of the reef.

General Pel reef (*Lat. 3° 9' S., Long. 122° 30' E.*), 1½ miles north-westward of Adder reef, consists of two rocky heads with a least depth of 3 feet; on the south-west rock is a white ball beacon, No. 2, which can be passed at 12 yards distance.

Tanjong Baja.—The reef runs off north-east nearly a mile from this point, with a detached depth of 2 fathoms 1½ miles 81° true from the point. On the north point of the reef is a black cone beacon, No. 3.

A reef of 3½ fathoms lies in mid-channel 5 miles, 303° true, from Tanjong Baja, and is marked by a red conical buoy on the south-east side. Tanjong Baja in line with Tanjong Togotonona, leads south of this reef, and of the edge of the flat eastward.

Salabangka islands, forming the northern side of the strait, are, with the exception of the conspicuous 674-feet hill on Toko Aja, low and covered with shrubs; they are all surrounded by a drying

General charts 3616, 942a, 1263, 2759a.

Chart 3148, Salabangka strait and approaches. Var. 2° 50' E.

coral reef, with many detached reefs inside the 100-fathoms line. The village Salabangka is situated on the island Paku (Buningkela), and the village Kaleruan on the island of the same name. Hondor islet lies on the edge of the drying reef south-westward of Kaleruan.

The Sinoa islands, the south-eastern group, consist of four uninhabited wooded island and numerous rocks, lying on a reef with irregular depths of one to 10 fathoms.

Togomogolo (Stagar), about 4 miles to the southward, is heavily timbered.

Tampanbaleh is the westernmost of the Salabangka islands; a white ball beacon, No. 3, is on the edge of the reef projecting 3 cables from the west end. The beacon on with the white patch westward of Tanjong Salabangka, 215° true, will clear the reefs north-east of the island.

Cape Nederburgh (*Lat. 2° 55' S., Long. 122° 18' E.*) on the west side of the north entrance to the strait, is a high, steep promontory; the rock Batu Manu lies close to the point. A line of shoals, 4 miles long and a mile off the main shore, obstruct the northern entrance.

Bantam reef, of 2 fathoms water, lies 2½ miles, 31° true, from Cape Nederburgh, and a small reef of one fathom lies about 1½ miles to the westward, just outside the 100-fathoms line.

Directions.—Entering Salabangka strait from the southward, the beacon on General Pel reef in line with the hill on Toko Aja, will lead westward of Adder reef; when Panjilili island is on with Tanjong Baja, the course is 332° true, westward of the beacon on General Pel reef, continuing this course until the beacon off Tanjong Baja can be left on the port hand with course 270° true. Thence the points of Tanjong Baja and Tanjong Togotonona in line will lead southward of the north side banks, and of the 3½-fathoms reef marked by the red buoy.

Leaving the strait to the northward, Hondor islet must not bear south of 107° true, until Tampanbaleh beacon is open east of Cape Nederburgh; the beacon can be rounded close-to, after which, to clear the reefs on both sides, Tampanbaleh beacon must be in line with the white patch westward of Tanjong Salabangka.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Salabangka every four weeks, from Makassar to Gorontalo and back.

Talowa bay, north-westward of Cape Nederburgh, has depths in it of 20 to 50 fathoms; the shore is fronted by a broad reef, and

General charts 3616, 942a, 1263, 2759a.

Chart 3148, Salabangka strait and approaches. Var. 2° 50' E.

several small islets and rocks lie in the back part. There are no important villages in the bay, and the reefs interfere with the entrance. Dwars in den weg and Kijk uit, $4\frac{1}{2}$ and 4 miles north-westward of Cape Nederburgh, partly dry.

Alang Alang (Zutphen island) lies on the coast reef off the north point of the bay, with numerous reefs in the neighbourhood inside the 100-fathoms line.

Chart 3616, Tomori gulf to Salayar strait.

Coast.—Between Tanjong Laroga, nearly 3 miles north-west of Alang Alang, and Tanjong Losoni, a distance of 10 miles, the coast curves in forming a wide bight; in the northern part is the village Bahunpombini, with anchorage off it in 28 fathoms. A large drying reef lies off the settlement Asumbatu, near the middle of the bight, $1\frac{6}{10}$ miles off-shore. Tanjong Losoni is steep and rocky; on the east side the reef dries out $1\frac{1}{2}$ cables, and is generally marked by surf; on the north side it projects much further.

Anchorage.—The village Losoni lies in a small creek 3 miles northward of the point, only a couple of houses being visible from seaward; two large reefs run parallel to the coast and about a mile from it, with a passage between them 4 cables wide and 14 fathoms least water. The north point of the southern reef is marked by a stake beacon. There is fair anchorage in 17 fathoms between the reefs and the shore; the course in is 247° true northward of the beacon.

Plan of Tombuku road on 2195.

Tombuku (Sakita) (*Lat. 2° 32' S., Long. 121° 58' E.*) is the most important settlement on this part of the coast, and consists of a number of villages lying along the shore; it is a very prosperous place, and there is a considerable trade in forest produce. Tombuku can be distinguished from a great distance by Gunong Kondeh, 1,890 feet high, with a remarkable wood on the summit; entering the road the flagstaff and mosque southward of it are conspicuous.

Before the village there is a small bight in the coast reef, and the detached line of reefs, separated from the coast reef by a narrow channel of more than 10 fathoms water, is broken for a distance of nearly 3 cables. The reefs are steep-to and the small detached part of $1\frac{1}{2}$ fathoms on the north side of the road is not easily distinguished near high water. A stake beacon with basket, in about one fathom water, marks the north point of the reef on the southern side of the road; this beacon in line with the flagstaff leads to the entrance, anchoring then in about 20 fathoms with the flagstaff bearing 214° true, about $1\frac{1}{2}$ cables 340° true from the beacon. The road is open to easterly and southerly winds, which quickly raise a heavy sea.

General charts 3616, 942a, 1263, 2759a.

Chart 3616, Tomori gulf to Salayar strait. Var. 2° 50' E.

Coast.—From Tombuku the detached line of reefs continues nearly to the village Epi, 3 miles to the northward, at one to $1\frac{1}{2}$ miles from the coast, the coast reef drying out to about 3 cables; from Epi to the village Wosso, 10 miles further, the coast is clear. Lononan, a prosperous village immediately northward of Tanjong Tabela, about midway, is conspicuous by its mosque. There is very good anchorage off Wosso in 10 to 12 fathoms, with the middle of the village bearing 225° true, taking care to avoid four drying reefs and rocks lying to eastward. Behind the village the land rises to a height of 2,630 feet.

Chart 2549, Tomori gulf.

Northward of Wosso many reefs lie under the coast and to the edge of the 100-fathoms line, which here gradually draws off-shore; a very conspicuous white sandbank, always above water, lies just north-westward of Tanjong Dongkala, $3\frac{1}{2}$ miles beyond Wosso, and outside that, close to the 100-fathoms line, is a long narrow reef, clearly marked by discolouration. A beacon with black truncated cone marks the north side of a one-fathom patch, 5 miles to the northward of Tanjong Dongkala, and a beacon with white ball marks a reef about 3 miles eastward of Tanjong Bahunbelo, 11 miles from Tanjong Dongkala.

In the bay between Tanjongs Bahunbelo and Lingkobu (*Lat. $2^{\circ} 3' S.$, Long. $121^{\circ} 31' E.$*) there is good anchorage, in 5 fathoms, off the village Towatu, about a mile from the shore. The depths decrease gradually, and there are no dangers inside the line joining the two points, except for a drying reef about three-quarters of a mile westward of Tanjong Bahunbelo; there is also very good anchorage close under the coast west of this point, and vessels of the Royal Netherlands Steam Packet Company load here.

TOMORI BAY is 5 miles wide at the entrance, between Tanjongs Lingkobu and One Matubu, and penetrates north-westward for 18 miles, with fairly regular depths of 20 to 30 fathoms. Inside the bay are many smaller bays, the principal being Lambolo and Tambajoli. The entrance points are low, but the shores within are high and rocky, except at the head, between the Peleru and Tambusisi mountains, which is low and swampy. Within the southern entrance point is Batu Pon, a remarkable hummock 590 feet high, which can be seen far out at sea.

The islands in the bay may be classed under two separate groups, the Tomori and Lambolo groups. The former stretch from west to east across the entrance, comprising Tomori, with the island Dediri to southward, Balo Sumpi, Nanaka, with Nanasi on the south-east point of the surrounding reef, Rumbia, Batu, and several islets and rocks

General charts 3616, 942a, 1263, 2759a.

Chart 2549, Tomori gulf. Var. 2° 50' E.

lying on a ridge north of Tomori. The Lambolo group run in a north and south direction, dividing the bay of that name into two parts, leaving a very narrow entrance of over 10 fathoms water between Tanjong Tapahulu and the reef projecting from the southern islet.

The high, thickly-wooded island Tokobaë lies in the northern part of the gulf, before the entrance to Tambajoli bay; this island, Tomori, and the stretch by the Sungi Ranu, are believed by the natives to be haunts of the devil in the form of a serpent or dragon.

For the reefs in the approach to the bay the chart must be referred to.

Kolonodale (*Lat. 2° 0' S., Long. 121° 20' E.*), situated in the southern part of Lambolo bay, is the head-quarters of the Dutch Government official. A stone pier is built out to just beyond the low water line, where boats can go alongside at all times. There is anchorage eastward of the pier in 7 to 8 fathoms.

Provisions are not obtainable.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Kolonodale every four weeks from Makassar to Gorontalo, both ways.

Anchorage.—The shores and islands of Tomori bay are very sparsely populated. Bungi ntimbe (Vesuvius island), near the southern entrance point, is the chief place of trade for forest produce, and is inhabited by Buginese. There is very good anchorage on the north side of the island, where loading and unloading can be carried on in both monsoons.

In Tambajoli bay there is anchorage in 10 to 12 fathoms at a suitable distance from the mudbank extending before the mouth of the Sungi Bajoli.

There is also anchorage close by the edge of the bank near the Sungi Morowali, abreast the Tomori islands. This river is very shallow, and only navigable for small native boats.

Rivers in Tomori bay.—Sungi La, one of the largest of Mid-Celebes, discharges in the southern part of the bay by Bungi ntimbe, and is entered between this islet and the Celebes coast, where the depths are 5 to 6 feet at low water. In the mouth itself the depths are not more than 3 to 4 feet, with a breadth of about one cable, which continues to the junction of the Sungi La moito, narrowing then from 30 to 45 yards with depths of 2 to 4 fathoms. About 2 miles from the mouth a much narrower and shoaler branch runs eastward, discharging by Tanjong Lingkobu. At

General charts 3616, 942a, 1263, 2769a.

Chart 2549, Tomori gulf. Var. 2° 50' E.

high water large praus can easily reach Tompira, a small Buginese settlement of about eight houses.

The Sungis Bajoli and Sumara flow through the low swampy land between the Peleru and Tambusisi mountains, and discharge in Tambajoli bay. The Sumara is a very winding, narrow, and shoal stream, but fresh water can be obtained a short distance from the mouth. The Sungi Bajoli is about 80 yards broad at the entrance, but by the village Watambajoli (*Lat. 1° 44' S., Long. 121° 19' E.*), which can be reached by a steamboat, the width is only 10 yards.

Reefs.—Innumerable reefs lie inside the 100-fathoms line, from the entrance to Tomori bay as far north as lat. 1° 33' S.; they are generally marked by discolouration, and the water is very clear, but the utmost caution must be exercised when navigating in this vicinity.

Beacons.—A white beacon, surmounted by a ball, marks a rock 2 miles eastward of Tanjong Lingkobu; black beacons, surmounted by truncated cones, mark the edge of the shoal water off Tanjong Lingkobu and Bungi ntimbe.

Tides.—The range of tide in Tomori bay is 5 to 6 feet at springs, 2 to 3 feet at neaps.

Directions for Tomori bay.—Under favourable circumstances the Tukala mountains, northward of the bay, can be seen from a great distance; the islands Batu, Rumbia, Tomori, and the remarkable hummock Batu Pon, afford good landmarks approaching the gulf.

From southward a course parallel to the coast is steered to Tanjong Dongkala; the beacon on the reef northward of this point is generally visible from Tanjong Tabela, and when seen may be steered for with course not northward of 312° true. This beacon is left on the port hand, steering then 277° true for a conspicuous clump of trees southward of Tanjong Bahunbelo (*see view on chart 2549*), which will lead southward of the beacon with white ball on the reefs eastward of Tanjong Bahunbelo. The course from abreast this beacon is 295° true until the beacon with white ball eastward of Tanjong Lingkobu bears 344° true, steering then to pass midway between the latter beacon and the beacon with black truncated cone marking the edge of the reef extending from the above point. When the beacon with black truncated cone on the reef projecting from Bungi ntimbe bears 294° true the course is 304° true for the channel between Tomori and Dediri, thence between Tomori and the main coast, eastward of Toko Dimba, westward of Batu Tengah, and for the anchorage off Kolonodale.

From northward the barrier reef on the edge of the 100-fathoms line is crossed close northward of the beacon with black truncated cone in lat. 1° 58' S., long. 121° 51' E., steering 262° true, to pass

General charts 3616, 942a, 1263, 2759a.

Chart 2549, Tomori gulf. Var. 2° 50' E.

about 2 miles southward of Tanjong Bea. When two points eastward of Tanjong Bea come in line on the bearing 44° true, the course is 284° true, steering just southward of the island Rumbia, and for the channel between Dediri and Tomori, when the east side of Batu island bears 0° true; thence as above for Lambolo bay.

Coast.—From Tanjong One Matubu the coast trends in a general north-easterly direction to Tanjong Damari (*Lat. 1° 41' S., Long. 121° 57' E.*), off which lies the rocky islet Mumu. The first part of this coast, to the village Tirongan, is low, swampy, and inaccessible; the principal village is Tukala, which can be recognised by the flagstaff of the chief's house. Northward of Tirongan the coast is steep, and forms several bays, in the largest of which the village Chaka is situated, partly built on the reef. A few islets lie on the coast reef westward of this bay, the largest being Boba.

Tukala mountains are a lofty range north of the entrance to Tomori bay; the northern and highest summit attains a height of 8,625 feet. Mount Morowali, 6,730 feet high, to the westward, and a 5,730-foot summit between, are also very conspicuous from southward.

Chart 3616, Tomori gulf to Salugar strait.

Ondoleon road.—Ondoleon is a small village about 4 miles to the north-eastward of Tanjong Damari, and is conspicuous by a house with zinc roof situated between cocoanut trees. The coast here forms a small bight almost filled in by the coast reef, and the reefs outside make the approach difficult. There is anchorage about 7 cables from the shore, in 12 to 15 fathoms, mud and sand. The village Bua Buang lies further north-eastward in the bight. The islet Tegonteon, a patch of sand with trees, lies on the coast reef, about 2 miles westward of the prominent Tanjong Rata.

Chart 942a, Eastern archipelago, eastern portion.

Coast.—From Tanjong Mantawa, nearly 8 miles eastward of Tanjong Rata, the coast trends to the north-eastward for 29 miles, to Tanjong Batui, and is low, but northward of Tanjong Senorong steep-to, the 100-fathoms line running there about a mile from the shore. There is anchorage in 10 to 12 fathoms off the village Dongi, conspicuous by the large roof of the store sheds.

About 2 miles southward of the village Topa are two reefs close together, with 2 fathoms water over them; these form the northern extreme of the great barrier of reefs running along the edge of the 100-fathoms line, across the entrance to Tomori bay, and approaching the coast again by the village Wosso.

General charts 3616, 942a, 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

There is anchorage off the Sungi Senorong in about 25 fathoms, half a mile from the shore.

PELENG STRAIT, separating Peleng island from Celebes, is a wide clear channel, except by the southern entrance, with depths in it of 300 to 600 fathoms. The stream to the northward sometimes attains a velocity of 2 to 3 miles an hour during the south-east monsoon.

Tides.—At Kientong, on the west side of Peleng strait, the double-daily tide slightly predominates, and is strongest when 0° moon's declination falls 1½ days after full and change; when the moon's greatest declination falls 1½ days after the quarters, the tide is single-daily. When 0° moon's declination falls 1½ days after the quarters, the tidal movement is very weak.

The double-daily tide has springs fully 3 days after full and change, with high water at IVh. and a rise of 3½ feet; neaps the same interval after the quarters, with high water at Xh. and a rise of about one foot.

The single-daily tide has high water on 1st January, at VIIIh. p.m.; 1st April, at IIh. p.m.; 1st July, VIIIh. a.m.; and 1st October, IIh. a.m.; with springs 1½ days after the greatest declination of the moon with a rise of 3 feet, increasing to 4 feet about the second half of June and December, and decreasing to barely 2 feet about the second half of March and September. Neaps fall 1½ days after 0° moon's declination, with a rise of half a foot, increasing to fully 1½ feet in the second half of June and December.

The high waters of spring tides of both groups cannot fall together, the low waters do in the beginning of June and December, when the moon's greatest declination falls 1½ days after full and change, the lowest water level being at Xh. p.m. and Xh. a.m.

Thames reef (*Lat. 1° 33' S., Long. 122° 39' E.*), nearly in the middle of the southern entrance, is a very steep atoll-shaped coral reef partly drying at low water, and is easily seen by its light green colour and surf.

Islands in Peleng strait.—The Banjak islands lie under the south-west coast of Peleng, and consist of a number of islets and wooded rocks on an extensive reef; Lesampuang, surrounded by a steep, drying coral reef, is separated from them by a channel fully one mile broad, with depths of over 200 fathoms.

Makailu (Sengkelong) lies about 3 miles from the west coast of Peleng, with depths of over 400 fathoms on either side: it is partly wooded, with high trees, and surrounded by a large drying reef.

General charts 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

Loh road, in the small deep bay immediately northward of **Tanjong Batui**, on the Celebes coast, affords anchorage in 24 fathoms, about 3 cables, 85° true, from the village. The **Sungi Batui**, in the southern part of the bay, is almost closed by a sandbank.

Plan of Kientong road on 2718.

Kientong, 10 miles northward of **Loh road**, is a prosperous village northward of the river of that name, and is easily recognised by a remarkable cleft in the mountains behind and some light green patches on the slopes. There is anchorage in 26 fathoms about 1½ cables from the shore.

Chart 942a, Eastern archipelago, eastern portion.

Mondono road.—**Mondono** village, 3 miles eastward of **Kientong**, lies partly on the coast, by the river of the same name, and partly on a plateau formed by a ridge from the mountains. There is anchorage south-westward of a clump of cocoanut trees, and a remarkable round-topped tree situated above the village, in 23 fathoms, about 2 cables from the shore; the depths outside increase very rapidly.

Plan of Luwuk bay on 2718.

Luwuk road, 12 miles north-north-eastward of **Mondono**, affords good anchorage in 25 fathoms, about 2 cables from the shore, with a cupola with flagstaff in line with the house of the Government official, bearing 316° true.

The village lies in the inner bay, which can only be entered by small vessels, although inside there is a deep basin.

Light (*Lat. 0° 57' S., Long. 122° 47' E.*).—A red fixed light is exhibited on the end of the pier off **Luwuk** village when vessels are expected.

Plan of Arjuno bay on 2718.

Arjuno bay, 15 miles eastward of **Luwuk road**, is a narrow inlet penetrating nearly a mile to the north-westward, with depths throughout of 15 to 17 fathoms. A long reef lies before the entrance to the bay, with three islets on it, leaving a narrow channel east and west to the anchorage.

Chart 942a, Eastern archipelago, eastern portion.

Telok Lamala is a large bay with low shores immediately eastward of **Arjuno**, with depths of 19 to 32 fathoms. A reef of 1½ fathoms lies nearly in the middle of the entrance: steering 0° true, or 18° true for a conspicuous tree in the north-eastern part of the bay will lead east and west of this reef, respectively.

Plan of Nona Petong bay on 2195.

Nona Petong bay is an inlet in the eastern part of **Telok Lamala**; before this creek the low swampy islet **Basum Pelan** lies, with large

General charts 942a, 1263, 2759a.

Plan of Nona Petong bay on 2195. Var. 2° 40' E.

reefs projecting from the north and west sides. A reef of $1\frac{1}{4}$ fathoms lies about $1\frac{3}{4}$ miles westward of the islet. There is anchorage in about 16 fathoms, north-eastward of Basum Pelan, near the mouth of a small rivulet; the passage in is midway between the islet and the point to the southward, steering 67° true for a very high conspicuous tree, thence to the northward to the anchorage.

Chart 942a, Eastern archipelago, eastern portion.

Coast.—From Telok Lamala the coast trends to the south-eastward for 12 miles to Tanjong Sentigi, and then eastward and northward for 11 miles to Tanjong Dongolalo. Northward of this latter point there is anchorage in 8 to 10 fathoms, 3 cables from the shore.

Plan of Belanta road on 2718.

Belanta road, $4\frac{1}{4}$ miles northward of Tanjong Dongolalo, affords anchorage in 10 to 16 fathoms, mud and sand; easterly and southerly winds raise a long swell, and landing in boats is not always practicable. The beach is high and steep. The village is scattered on the slopes of a mountain 2,697 feet high. A small stream flows out by some white cliffs southward of the village.

Chart 942a, Eastern archipelago, eastern portion.

Pulu Dua are two uninhabited islets, $8\frac{1}{2}$ miles northward of Tanjong Dongolalo, separated from the main coast by a passage with 7 fathoms least water, through which a very strong stream runs. The northern islet is 325 feet high, and has a small sandy beach on the north side, with a fresh-water lake behind; fully 2 cables to the northward is a partly-drying reef, with a rock above water.

Tanjong Pangkalsiang (Lat. $0^\circ 42'$ S., Long. $123^\circ 27'$ E.), the south-east point of the Gulf of Tomini, and Tanjong Talabu, 4 miles to the southward, rise almost perpendicularly from the sea, the high mountain land terminating close to the coast. Two drying reefs named Batu Tetek lie half a mile from the latter point; the breakers over them can be seen from a great distance.

BANGGAI ARCHIPELAGO (Bangaai).—The four most important islands of this group are Peleng, Banggai, Labobo, and Bangkulu, all inhabited and surrounded by a number of smaller islands. They are ruled by a Rajah residing at Banggai, and are under the Government of East Celebes. The inhabitants may be divided into two classes—those who dwell on the coast are a mixed race professing the Mohammedan faith; the mountain dwellers are a very primitive race of pagans, avoiding touch with the former as much as possible. The islands produce good timber, including a large quantity of ebony.

With the exception of a part of Peleng, these islands and dangers are imperfectly known.

General charts 942a, 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

Peleng, the northern and largest of the group, is a mountainous, thickly-wooded island of irregular outline, forming many bays, little being known of those on the south side.

Near Tanjong Batu Putih (Angus), the north-west point, are two inhabited caves concealed by bushes; the remainder of the north coast as far eastward as Bangkalang bay is very steep and entirely uninhabited.

Plan of Bangkalang bay on 2195.

Bangkalang bay, in the middle of the north coast, the inner part of which is named Telok Ambelang, penetrates southward about 12 miles, with depths of 14 to 30 fathoms; the shores are high and thickly wooded, and several islets lie on the west side. The islands North and South Bangkalang lie at the entrance to the bay, with a clear passage on either side; the channel between the two islands is deep, but not to be recommended on account of the strong current. There is anchorage anywhere in the bay. The dome-shaped Mount Tinankong, 1,496 feet high, lies at the head of the bay, and a conspicuous peak of 1,830 feet lies to the north-eastward. There are some fresh-water brooks near the village Ambelang, in the southern extreme of the bay, and a forest path leads across to Mesamat bay.

Plan of Lelompang bay on 2718.

Lelompang bay, the small bay eastward of Bangkalang, affords excellent anchorage, sheltered from all except northerly winds. The entrance is clear, and the scattered houses of the village Luwuksago, at the head of the bay, may be steered for, anchoring in 8 to 9 fathoms about 4 cables eastward of two rocky islets. Good water may be obtained from a stream westward of the village. Pondi Pondi islet (*Lat. 1° 13' S., Long. 123° 25' E.*), northward of the western entrance point, may be seen from a considerable distance.

Chart 942a, Eastern archipelago, eastern portion.

Peleng bay, on the south side of the island, affords anchorage in 16 fathoms off the village Lalontong on the western side, with the point southward of the village bearing 207° true, and the tongue of land eastward, 332° true. Two large reefs, marked by stakes, lie southward of the anchorage.

The islet Bongko, northward of Bangkulu, in line with the north-east side of that island, leads between Malappatia reef, on the western side of the entrance, and the coast reef extending from Tanjong Pati-pakaman.

Mesamat bay is said to be obstructed by reefs, the western side only being navigable, as the reefs there are less numerous and generally

General charts 942a, 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.
marked by discoloured water. The large village Liang lies in an inlet on the western shore.

Kalumbatan strait affords a safe passage between Peleng and Banggai, although a strong current of 4 to 7 miles an hour runs. The island To Ulon lies in the southern entrance, and Kalapa and seven rocks on the east side of the northern entrance.

Kalingin reef, of $3\frac{1}{2}$ fathoms water, lies 4 miles to the south-westward of To Ulon. There is good sheltered anchorage in about 6 fathoms, south-eastward of To Ulon.

Plan of Banggai bay on 2195.

Banggai bay.—Banggai, the principal place of the archipelago, and seat of the Rajah, is situated in a fairly spacious bay on the west coast of the island of that name. The Rajah's house, built on a height, and a mosque are conspicuous objects; there is also a ruined fort. There is very good anchorage in about 11 fathoms.

Light (*Lat. 1° 35' S., Long. 123° 29' E.*).—A *fixed red* light, visible from a distance of 2 miles, is exhibited, at an elevation of 16 feet, from the outer end of the pier in Banggai bay.

Shoal.—A shoal, about 2 miles in extent, on which a sounding of 10 fathoms was obtained, but with probably less water, has been reported (1913) about 15 miles eastward of Banggai in lat. 1° 37' S.; it was marked by discoloured water.

Chart 3616, Tomori gulf to Salayar strait.

Labobo and Bangkulu, south-westward of Banggai, are fairly high, thickly wooded islands, each with about 100 inhabitants; the islet Bongko lies close northward of the latter.

Sago, the southern of the Banggai archipelago, is a high islet, visible about 24 miles.

The southern portion of the archipelago consists of numerous reefs separated by narrow channels of over 100 fathoms water. The northern part of these reefs is navigable, the depths averaging 12 to 13 fathoms, and the dangers being easily avoided; the southern part is unnavigable, many drying places rising out of depths of over 100 fathoms on the south edge.

Chart 942a, Eastern archipelago, eastern portion.

Greyhound strait separates the Banggai archipelago from the Sula islands; on the western side are Tempau with several reefs to the southward, on the eastern the islands Mazoni and Seho. A stream running north and south, with a velocity of 3 miles an hour, was observed.

Tempau is a fairly high island, except the south-eastern part, which is low and bare. On the east side is an inlet with several islets and probably reefs before it. A line of reefs, with deep channels between, extends $9\frac{1}{2}$ miles to the south-eastward.

General charts 3616, 942a, 1263, 2579a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

Masoni is low, wooded, and surrounded by reefs for one to 2 miles; a reef of 4 fathoms water lies close southward, and 8 and 11 miles northward are two shoal patches of 8 and 7 fathoms, respectively. Lembau island, close to the west coast of Taliabu, is also low and wooded. The passage between the reefs projecting from these two islands is about 2 miles wide, but should not be used without local knowledge; three reefs lie in the southern entrance. Bylandt reef, nearly midway between Lembau and Seho, was reported as discoloured water extending over a length of about 2 miles, and is probably a detached reef.

Seho is a fairly high island with a conical summit; five small islets lie by the north-west point, and there is anchorage in 12 fathoms under the south-west coast. The small islet Kano (*Lat. 2° 1' S., Long. 124° 21' E.*) lies off the south-east point, and the rock Batu Andor lies on the edge of the reef projecting from its south side.

SULA ISLANDS consist of the three large islands Taliabu, Mangola, and Sula Besi, with many smaller ones; they are all under the residency of Ternate, but belong, both geographically and zoologically, to Celebes. They are high, bold islands, thickly wooded, and very fertile; there are no rivers of any importance, and the dry beds of the streams form the only tracks to the interior.

There is no reliable information as to the strength of the natives, but they derive their origin from the inhabitants of central Celebes, are uncivilised, avoid contact with the coast inhabitants, and barely acknowledge the authority of the Sultan of Ternate. The coast inhabitants are a mixed race of the Mohammedan faith, and are good farmers and carpenters, the islands producing excellent wood for ship-building, &c.

Taliabu, the western and largest island, is about 75 miles in length in an east and west direction. The central part is occupied by a range of mountains from 3,000 to 4,000 feet high, with disconnected hills to southward, attaining heights of 650 to 950 feet. Little is known of the north coast.

From Tanjong Endolodeo, the south-eastern point of Taliabu, the south coast trends westward to Safau rivulet, and consists of small beaches, alternating with stones and rocks covered with bushes. A gently-sloping ridge of hills extends along this part of the coast, the highest point being Safau hill. There is anchorage off Safau rivulet in 26 fathoms, one cable from the shore, with Safau hill bearing 312° true. Westward of Safau hill is Kamaya bay, with a white strip of sand, and in front of it is a reef of 4½ fathoms water. Close westward there is anchorage in Wai Nono bay in 21 fathoms, with the mouth of the river of that name bearing 7° true. Tanjong Wai Nono,

General charts 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

on the western side of this bay, is formed by an isolated hill, and is fronted by a small reef with deep water outside; the coast on the east side of the point may be recognised by the light colour of the vegetation. Two small rivers, the Wai Galo and Wai Hoko, with a small village between them, consisting of some huts on the beach, discharge westward of Tanjong Wai Nono; there is anchorage in 8 fathoms, with the village bearing 45° true. A little further westward, near Tanjong Hoko, two rocks with about 2 fathoms water over them lie before the mouth of the Wal Posso.

Between Tanjongs Hoko and Kadai the coast forms another bight, in which the Wai Kadai and Wai Hussi discharge; several huts under cocoanut trees stand near the mouths of these streams, and there is anchorage in 7 fathoms with Tanjong Wai Nono in line with Mount Buja, and Tanjongs Kadai and Mantarara in line. Tanjong Kadai is formed by an isolated hill.

In the large bay between Tanjongs Kadai and Mantarara the Wai Kuju, Wai Husu, Wai Sangho, and Wai Mantarara discharge. On the coast are numerous blocks of dead coral, frequently projecting over 30 yards into the sea. There is anchorage in 8 fathoms before the Wai Kuju, and in 15 fathoms before the Wai Mantarara. On the beach near the latter anchorage, at the western end of a strip of cocoanut trees, are some hot springs, which may be recognised in the morning by a white vapour above them.

Between Tanjongs Mantarara and Tebukain is a small sandy bight into which the rivulet Kawada flows. Westward of the latter point the coast continues low and sandy, and forms a bight in which the Lawi, Luku, and Tanam discharge. There is anchorage in about 20 fathoms off the village Sofa.

Tanjong Pasturi is high, with trees growing in the water; in the bight westward the Noja, Tabona, Kabula, and Taha discharge, and near the crest of the mountains northward of Kabula is a waterfall, visible from seaward. There is anchorage in 28 fathoms before the mouth of the Wai Miha; the eastern mouth can be entered by boats, and the water is always fresh and remarkably clear.

Wojo (*Lat. 2° 1' S., Long. 124° 37' E.*) is a small islet of about 1½ cables diameter, and 32 feet high in the southern part; the northern part is low and sandy.

Lekitobi, the principal place of Taliabu, is a collection of squalid houses, built towards the steep mountain slopes, though from a distance its appearance is not unpleasing. The village can be reached in 1½ hours rowing through a channel running through swampy land, terminating northwards in a lake. The reef from Tanjong Lekitobi

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

extends fully 2 miles, as at low water a rock was seen at that distance from the point.

Batu Tiga are three wooded rocks, with several smaller ones between, joined by a reef. There is anchorage 7 cables eastward of the largest rock in 13 fathoms water.

Plan of Chapalalu strait and Vesuvius bay on 3440.

Chapalalu strait, the narrow passage separating Taliabu and Mangola, is barely 3 cables wide at its narrowest part, by the southern entrance. The tidal streams in the southern entrance sometimes run at the rate of 4 to $4\frac{1}{2}$ knots, causing heavy tide-rips and eddies, having the appearance of breakers; one vessel reported a current to the northward of 13 miles an hour.

Tanjong Endolodeo, on the western side of the southern entrance, is sandy and partly covered with broken coral; on its southern side is an isolated hillock that shows up well when seen along the south coast of Taliabu. Northward of the point the coast curves in, and the land becomes higher, with a low sandy beach in front, varied by rocky parts, with many trees cast up by the sea.

Tanjong Lagoi, formed by a spur from the high interior, is conspicuous and very steep. Lagoi rivulet discharges northward of the point, and the coast is rocky near it, but northward becomes low and marshy.

Tanjong Pombu, the north-east point of Taliabu, is surrounded by a broad coast reef. Also there are numerous inlets met with here, forming peninsulas, or perhaps islands, and causing difficulty when making the strait from northward.

On the east side, northward of Tanjong Sakomata (*Lat. 1° 53' S., Long. 125° 27' E.*), the south-west point of Mangola, is a sandy beach where native craft usually wait a favourable opportunity to enter the strait, ending in a sloping cliff named Batu Gossok; hence the coast trends northward nearly in a direct line to Tanjong Menjanji, with the two slightly-projecting points Taramala and Nubu, between which the coast is rocky.

A large detached coral reef runs parallel to the coast between Tanjongs Nubu and Menjanji, on which depths of 5 fathoms were found, but as it has not been thoroughly examined less water may exist.

Near Tanjong Menjanji, where the hilly land again approaches the coast, there are several huts and traces of gardens. The coast then trends more to the north-eastward to Tanjong Ndoffa, northward of which is a deep inlet, possibly forming an island.

Chart 942a, Eastern archipelago, eastern portion.

Crab island lies close to the Mangola coast, eastward of the northern entrance to the strait.

General charts 942a, 1263, 2759a.

Plan of Chapalalu strait and Vesuvius bay on 3440. Var. 2° 40' E.

The depths in the strait generally appear to be over 9 fathoms, except for the large reef mentioned above; close off Batu Gossok there was no bottom at 10 to 15 fathoms, although from the appearance of the ripples in the western part of the southern entrance it is quite possible that a ridge with little water over it exists.

Directions.—To enter Chapalalu strait from southward, pass Batu Gossok at a distance of from one to $1\frac{1}{2}$ cables, bearing in mind that here the vessel is liable to sheer about under the influence of the eddies, and then steer across to close the Taliabu shore, keeping $1\frac{1}{2}$ to 2 cables from it, but lessening the distance a little when passing Tanjong Lagoi; then steer more to the eastward to avoid the reef extending from Tanjong Pombu.

From the northward, steer to open the strait, for the numerous creeks near the entrance may give rise to error. When the steep Tanjong Lagoi is recognised, steer eastward until it bears 22° true, and then steer for it on that bearing, passing it at a short distance, and taking care not to close Tanjong Menjanji.

For the remainder of the Sula islands, *see* Eastern Archipelago Pilot, Part III.

Chart 942a, Eastern archipelago, eastern portion.

GULF OF TOMINI or GORONTALO, separating the northern and eastern peninsulas of Celebes, is about 200 miles deep, and has a greatest breadth of 110 miles. The depths are very great, soundings of over 1,000 fathoms having been obtained over a considerable portion. Over a great part of the coast a barrier reef runs along the edge of the 100-fathoms line, with numerous reefs and some islets inside. Navigation generally presents little difficulty in the gulf, and the weather is nearly always favourable, the sea calm, and the currents weak. There are few spacious anchorages, but sheltered places close under the coast can be found almost everywhere. The gulf is surrounded by very high mountain land with lower plains in front, except where there is no barrier reef, when the mountains generally approach the coast. With the exception of the Sungi Poso, on the southern side, there are no rivers of any importance.

The shores of the gulf eastward of Tanjong Api (*Lat.* $0^\circ 48' S.$, *Long.* $121^\circ 39' E.$) are under the Residency of Ternate, from Tanjong Api westward, round the northern shore, also the Togian islands, are under the Residency of Menado; these are again subdivided into a number of smaller districts. Forest produce and copra are the principal articles of export.

Winds and weather.—In the Gulf of Tomini monsoons are weak, with large percentages of circulating and varying winds. The

General charts 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

north monsoon lasts from December to April, when winds may blow from north to north-west. From May to October south-south-east to south-south-west winds prevail, but it blows also from other directions, especially in September, and this south monsoon cannot be relied on.

Constant strong winds are seldom experienced; heavy squalls and thunderstorms are rare. There are no regular wet and dry seasons, and showers occur any time in the year. Land and sea breezes are fairly regular.

Tides.—At Gorontalo, on the north shore of the Gulf of Tomini, the tide is mixed, with a preponderating double-daily character, entirely so about 2 days after 0° moon's declination falling with full and change; when the greatest declination of the moon coincides with the quarters, the tide is single-daily.

The double-daily tide has springs fully 2 days after full and change, with high water at about VIh., and a rise of 2½ feet; neaps the same interval after the quarters, with high water at the same time, and a rise of half a foot.

The single-daily tide has high water on 1st January about VIh. p.m.; 1st April, mid-day; 1st July, VIh. a.m.; and 1st October, midnight; springs occur fully 2 days after the moon's greatest declination, with a rise of 2½ feet, neaps the same interval after 0° moon's declination, with a rise of one foot.

The high waters of both groups fall together whenever, in the first half of January and July, full and change occurs with the moon's greatest declination; the highest water levels are then reached at VIh. a.m. and VIh. p.m. The lowest water levels are in the first half of April and October at midnight and mid-day. When 0° moon's declination falls with the quarters the movement of the water is very weak.

At Poso (*Lat. 1° 23' S., Long. 120° 45' E.*), on the south side, the tide is entirely double-daily when full and change falls one day before 0° moon's declination; when the greatest declination of the moon falls one day after the quarters the tide is single-daily, strongest about the second half of June and December.

The double-daily tide has springs nearly 2 days after full and change, with high water at Vh. 30m. and a rise of 3 feet; neaps the same interval after the quarters with an almost imperceptible rise.

The single-daily tide has high water on 1st January about Vh. p.m.; 1st April, XIh. a.m.; 1st July, Vh. a.m.; and 1st October, XIh. p.m.; springs fully one day after the greatest declination of the moon with a rise of 2 feet, neaps fully one day after 0° moon's declination with an inappreciable rise.

General charts 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

The high and low waters of both groups cannot fall together. The highest levels are reached about the latter half of June and December at Vh. a.m. and Vh.p.m., respectively; the lowest about the latter half of March and September at XIh. 30m. p.m. and XIh. 30m. a.m., respectively.

Tide gauges were also set up at Menelili and Pagimana, and the results obtained show that the range and times of high and low waters are practically the same throughout the gulf.

Tidal streams in the Gulf of Tomini are weak, and are stronger along the edge of the barrier reefs than inside.

SOUTH AND WEST SHORES.—From Tanjong Pangkalisang (page 495) the coast gradually bends to the westward to Tanjong Batu Hitam (*Lat. 0° 40' S., Long. 122° 43' E.*), the northern point of Poh gulf, and is generally high and steep. Almost in the middle of the line joining these points is a massive mountain plateau with two summits, the eastern and highest being 5,217 feet, and in fine weather visible from the opposite shore of the gulf. The 100-fathoms line curves parallel to the coast to Mentawatu Daä, and then runs in a direct line to the Togian islands. Eastward of Mentawatu Daä the coast is free from dangers, and anchorage may be found everywhere; westward of that island many dangerous reefs lie inside the 100-fathoms line.

Plan of Ampat islands anchorage on 2195.

Anchorage.—Pulu Ampat, about 7 miles north-westward of Tanjong Pangkalisang, are four low islets of sand and coral; the eastern is a sandbank always above water, the remaining three are wooded. Between the westernmost and the next one to it is a passage half a mile broad of 4 fathoms least water, and close against the south side of the latter islet there is excellent anchorage in 5 to 6 fathoms, sand. This anchorage can also be reached from eastward by passing close southward of the two eastern islets.

Plan of Bualemo road on 2195.

There is very good anchorage off the little village Bualemo (*Lat. 0° 34' S., Long. 123° 9' E.*), in 9 to 10 fathoms, with a conspicuous hillock bearing 180° true.

Chart 942a, Eastern archipelago, eastern portion.

Directions.—The passages between the reefs and islets off the above-described coast are of little importance, as Walea strait affords a deep and clean channel, and there is also a good channel between Puah and Bani (page 504). Vessels, however, bound for Poh gulf from eastward, may shorten the distance by crossing the 100-fathoms

General charts 942a, 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

line about $5\frac{1}{2}$ miles westward of Sendiri islet, with Bang islet nearly in line with the saddle islet Japara (as shown in view at page 472). From this position the course is 219° true, passing fully half a mile westward of Bang, and taking care by cross bearings to remain on this line, which westward of Tanjong Batu Hitam leads between an islet on the starboard hand and a reef on the port hand once more into deep water.

There is also an inshore passage from Bualemo to Tanjong Batu Hitam, passing southward of Mentawatu Kiki and northward of the islet Jewas.

TOGIAN ISLANDS.—The principal islands of this group, which extends about 70 miles east and west, are Puah, Walea Bahi, Walea Kodi, Talata Koh, Togian, Batu Daka (these last three are separated by such narrow channels that they almost form one island), and Una Una. The navigation between these islands, excepting Una Una and the others, for vessels of any size is very dangerous on account of the innumerable reefs and sandbanks. The group is almost surrounded by a barrier of reefs with depths of over 100 fathoms immediately outside. The islands are hilly and densely wooded; the peak on Togian, 1,855 feet high, is visible from nearly the whole of the gulf.

The islands are sparsely populated, and the inhabitants exist chiefly by the cultivation of cocoanut trees.

Puah is hilly, with the highest part on the west point; the north and west sides are very steep; on the south side are two villages. The small islet Bangu lies near the north-west point.

The islet Bani lies about $1\frac{1}{2}$ miles off the east point of Puah, with a clear channel between. To enter this channel from eastward the course is along the east side of Dondola (*Lat.* $0^\circ 25' S.$, *Long.* $122^\circ 38' E.$), a small islet near the edge of the 100-fathoms line, thence between Puah and Bani, and along the south side of Puah.

The course from southward for the village Puah is 48° true for the islet Bani, passing between two small islets near the 100-fathoms line, and steering for the western village when bearing 343° true, anchoring in 17 fathoms in a bight in the coast reef.

Walea strait, between the plateau extending from the south side of the gulf and that of the Togian islands, is about $1\frac{1}{2}$ miles wide, with depths of 255 fathoms in the middle. Rippings are frequently seen in the strait, but it is a safe passage. A reef of $3\frac{1}{2}$ fathoms lies inside the edge of the 100-fathoms line on the north-west side. The small islet Teloga, on the south-eastern side of the strait, is an invaluable mark.

General charts 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

Beacon.—A beacon with white ball marks the edge of a drying reef on the south-east side of Walea strait.

Walea Bahi and Walea Kodi are separated by a fairly broad channel, which can be entered from southward by steering close along the reef projecting from the south-east point of Walea Bahi, and then proceeding with the utmost caution in a north-westerly direction between this island and the innumerable reefs westward.

Walea road.—On the north coast of Walea Bahi is a small bay penetrating southward about a mile, with the village Walea, consisting of about ten houses, at the head. A small wooded islet lies on the west side of the entrance, with a reef projecting about 2 cables to the eastward, and a reef of $2\frac{1}{2}$ fathoms water lies before the entrance. The course in, between these reefs, is 201° true, and there is good anchorage in the middle of the bay in about 27 fathoms, mud and sand.

Taoleh and Malingi lie westward of Walea Kodi; the north side of the latter is very steep and uninhabited, the east and south sides appear fertile, as there are a number of cocoanut plantations and some settlements. Near the west point is a large white patch of limestone, visible far out to sea.

Togian is separated from Talata Koh by a narrow strait, navigable for small steam vessels exercising caution, and is the highest island of the group. On the north side of the island are a number of small bays, and close under the coast the islets Pangimpan, Bolelan-gan, Tengkabo, and Talawanga; the last is in the shape of a sugar-loaf, and is very conspicuous. Langkara, more to the northward, is steep.

Plan of Togian bay on 2718.

Togian bay.—The village Benteng (*Lat. $0^\circ 24' S.$, Long. $123^\circ 0' E.$*), where the chief of the Togian islands resides, is situated at the head of a narrow inlet about 2 miles long, on the southern side of Togian, affording sheltered anchorage from all winds. The islets Mogo besar and Mogo kechil lie before the entrance; the latter islet, as well as the shores of the bay, is covered with mangroves.

Directions.—To enter Togian bay steer for a remarkable high tree on the south side of Mogo besar on the bearing 19° true, which will lead westward of a small reef of about 2 fathoms water southward of that islet. The south side of Mogo besar may be closely rounded as the coast reef only projects about three-quarters of a cable, turning then to the north-westward between the reefs on either side, which are easily seen and generally marked by perches. When abreast the north point of Mogo besar the course is 350° true, keeping a high point on the eastern side of the bay just on the port bow; the channel here is only about a cable wide. When midway between this point and Mogo

General charts 1263, 2759a.

Plan of Togian bay on 2718. Var. 2° 40' E.

kechil a mid-channel course is held, anchoring in 9 to 10 fathoms in the inner part of the bay.

Chart 942a, Eastern archipelago, eastern portion.

Batu Daka is separated from Togian by a very narrow channel, unnavigable for large vessels on account of the number of reefs, especially in the southern part. The island is hilly, but has no conspicuous summits, and on account of its stony character is almost uninhabited, the only village being Batu Daka on the north-east side. Round the island are a large number of reefs, rocks, and islets. The southern side rises steeply out of the sea, and forms a large bight, the 100-fathoms line running about half a mile from the shore. Between Tanjong Chopatanah, the south-west point, and the densely-wooded island Taupan, there is a passage fully one mile broad, with depths of over 100 fathoms. On the west and north sides of Batu Daka the barrier reef runs from $1\frac{1}{2}$ to 3 miles from the coast, with several drying places of sand and coral and occasional gaps; between this barrier reef and that extending from the coast are fairly regular depths of about 25 fathoms.

Una Una lies about 20 miles northward of the west point of Batu Daka, and is of volcanic formation. Earthquakes are not infrequent, and in 1898 there was a heavy volcanic eruption; smoke or steam may be seen periodically above the island. The island attains a height of 1,639 feet near the middle, and is very fertile in the lower parts; scattered dwellings lie along the entire coast, and a broad road runs from the village Una Una, on the north-east coast, to Kalolih on the south-east coast. The island is steep-to, depths of over 100 fathoms being found at 4 cables distance.

Plan of Una Una road on 2718.

Una Una road.—Beacons.—A beacon with white ball marks the extremity of the northern entrance reef, and a beacon with black truncated cone the extremity of the southern reef.

Anchorage (*Lat. 0° 8' S., Long. 121° 38' E.*).—There is fairly good anchorage off the village Una Una in 28 fathoms, with the flag-staff bearing 337° true, and the beacon with white ball on the edge of the northern reef, 24° true.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Una Una about twice a month, and occasionally visit Walea, in Walea Bahi.

Chart 942a, Eastern archipelago, eastern portion.

Poh gulf.—Southward of Tanjong Batu Hitam the coast forms a gulf penetrating about 20 miles eastward, and surrounded on all

General charts 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

sides by high mountain chains. The north side of the bay is very steep; on the southern side the 100-fathoms line is further from the shore, and several reefs lie northward of the village Dindinga; the northern of these reefs is marked by a beacon with white ball. Elsewhere there are no dangers.

Plan of Pagimana road on 2718.

Pagimana is an important trading place, and the inner part of the road affords very good but confined anchorage in about 14 fathoms; for vessels remaining only a short time it is better to anchor in the outer road in about 26 fathoms, as there is little room to turn further in. There is a small drying bank of mud off the village; elsewhere the shore is fronted by coral. Fresh water can be obtained from a stream about a mile eastward of the village.

Three detached drying reefs lie before the road, and further outside are two reefs of 5 fathoms and 3 feet least water; the latter is marked by a beacon with white ball.

Chart 942a, Eastern archipelago, eastern portion.

Coast.—From Pagimana the coast runs in a general westerly direction for 30 miles to Bunta road, with hills of moderate height near the coast and high mountains behind. There appear to be no dangers off this part of the coast except a reef of $2\frac{1}{2}$ fathoms water reported to lie to the north-north-westward of Lobu village, and about a mile off-shore.

Kabini reef, awash at low water, lies off Bunta road, 3 miles from the coast, and is marked by a beacon with black truncated cone.

Plan of Bunta road on 2195.

Bunta road (Lat. $0^{\circ} 50' S.$, Long. $122^{\circ} 10' E.$) can be easily recognised by the beacon on Kabini reef and the islet Paniki. The town of Bunta is one of the greatest centres of the whole Gulf of Tomini; when clear of the point northward a number of houses, a large cocoanut plantation, and a mosque come in sight. There is very good anchorage before the mosque in 23 fathoms.

Plans of Tobelombangi, Balingara, and Sabo, on 2195.

Anchorage.—Tobelombangi, Balingara, and Sabo are three small places on the coast in the large bight between Bunta and Tanjong Api. They are occasionally visited by small steamers, but the anchorages are so near the shore, on account of the rapidly increasing depths, that hawsers to the land are necessary.

General charts 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

Tanjong Api is the first distinctive feature of the land westward of Tanjong Batu Hitam; it rises to a flat summit of 1,821 feet, with a very low, broad strip of land between it and the high mountains behind, giving it the appearance of a large island when seen from east or west.

In Labuan Blanda, westward of the point, there is anchorage close under the coast, eastward of Ampana village, in about 30 fathoms.

Buka Buka, 433 feet high, lies 7 miles to the north-eastward of Tanjong Api, with a clear passage between.

Coast.—From Tanjong Api the coast turns sharply to the south-westward, forming the eastern side of a deep, wide bay, and is generally very steep, the mountains coming close to the coast. Near the village Bongka, 19 miles from Tanjong Api, is a dome-shaped hill, 777 feet high, and a small river discharges here. A small isolated reef of one fathom least water, marked by discolouration and surf, lies about a mile to the north-westward of Tongku village, 20 miles further.

Plan of Tojo road on 2195.

Tojo (Taliboi) road.—Tojo village, 40 miles from Tanjong Api, where the chief of the district resides, is situated on the left bank of the river of that name, and is a place of some importance on account of the export in forest produce; the village Baru is on the right bank. The narrow strip of land, on which both villages are built, is enclosed by high mountains, the valley of the river affording the only access to the interior. The villages consist of 70 houses with a population of about 900.

The anchorage is in about 15 fathoms, steering for the steep, rocky slope of Mount Kandela. The river is infested by crocodiles, but very good water may be obtained.

Plan of Banano road on 2195.

Banano road (*Lat. 1° 21' S., Long. 121° 8' E.*).—Making for this anchorage from northward vessels should pass eastward of the drying reef in the northern part of the road, which is separated from the coast by a passage 2 cables wide with depths of 10 to 18 fathoms. On the south side of the bight the coast reef dries out 2 cables, and a stream flows out of a group of cocoanut trees. Good water can be obtained from the Sungai Betauwa, which discharges about a mile southward of Banano.

Chart 942a, Eastern archipelago, eastern portion.

Coast.—From Banano the coast continues to the south-eastward for a further 5 miles, and then turns to the westward. The village

General charts 1263, 2759a.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 40' E.

Oëekuli, on the fairly broad river of that name, is situated in the eastern corner of the bight thus formed, and there is a road from here to Tomori bay. South-eastward of Banano is a remarkable sharp peak, Untu Jowi, 3,288 feet high. The small bight between Oëekuli and Tanjong Lemo is studded with reefs, and local knowledge is necessary for the passage through them; a barrier reef edges the 100-fathoms line as far as Tanjong Tibu, but westward of that point the coast is clear, except for a small drying reef near the mouth of the Sungi Toliba, 3 cables off-shore.

There is temporary anchorage in 20 fathoms, about one cable from the shore, off the village Tongku, which is easily recognised by a cocoanut plantation, and by Bultberg, 2,145 feet high. The coast turns to the northward here for $2\frac{1}{2}$ miles, forming Tanjong Karawasa.

Plan of Poso road on 2195.

Poso (Lat. $1^{\circ} 22' S.$, Long. $120^{\circ} 45' E.$), 6 miles westward of Tanjong Karawasa, is situated at the head of a small bay on the right bank of the river of that name, and is the head-quarters of the Dutch Government official of the Poso division. The road is small, but affords good shelter except in northerly winds; the depths rapidly increase, and vessels of any size must anchor in not less than 40 fathoms, steering in for the right bank of the river where there is a remarkable tree. A strong current sometimes sets out of the river, so that a land-fast is advisable. Landing is difficult at low water, but at high water can generally be effected near the road leading past the Contrôleur's house. There is a wooden coaling pier at Poso, and vessels secure alongside in $3\frac{1}{2}$ fathoms water. A coal store and factory are on the pier head.

The Sungi Poso flows out from the large lake of that name, and has a breadth of about 100 yards at the mouth, gradually decreasing to 50 yards. The mouth is shallow, but inside the depths are 3 to 7 fathoms, and in the dry season Rumuru can be reached in "blottos" (hollowed-out tree trunks) in about two days; in the rainy season the current is strong. Rumuru is the junction of many paths from the interior, along which forest produce is conveyed and then shipped in "blottos." Good drinking water can be obtained from the river.

Climate.—Rain falls fairly frequently at Poso all the year, but the dry season may be said to last from August to December. In the wet season the climate is very regular, with a temperature of 73° to 75° Fah. in the morning, increasing to 85° and 90° Fah. in the middle of the day. In the dry season the days are hot, but the nights cool.

Tides.—See page 502.

Plan of Mapane road on 2195.

Mapane, 5 miles westward of Poso, is an important place of trade for forest produce; the village is very conspicuous from sea-

General charts 942a, 941b, 1263, 2759a.

Plan of Mapane road on 2195. Var. 2° 40' E.

ward. The anchorage is in 34 fathoms, 3 cables from the shore, with a remarkable tree near the village, bearing 225° true. Vessels must not anchor in less than 16 fathoms, on account of the very steep bank projecting from the coast.

Chart 942a, Eastern archipelago, eastern part.

Coast.—From Mapane the coast trends in a north-by-easterly direction, and is almost uninhabited as far as Tambu bay, a distance of 24 miles. There are several reefs in Tambarana bay, but as this part of the coast is seldom visited, they are of little importance, and it is safer to remain in deep water.

Plan of Tambu bay on 2195.

Tambu bay is easily recognised by a white sandy beach on the north side; the entrance should be steered for with course 231° true, and there is very good anchorage in 17 fathoms with the north-east point of the bay bearing about 24° true. The inner part is only serviceable for praus, and the creek at the head contains salt water.

Chart 2636, Strait of Makassar, north part.

Tanjong Sausu is an outstanding point covered with high trees and a few houses outside. The river of the same name, formed by the junction of different streams, flows out by the point. In westerly winds sheltered anchorage may be obtained southward of Tanjong Sausu, veering 30 fathoms of cable and steaming towards the shore until the anchor holds. There is also sheltered anchorage about 2 miles westward of the point, where a sandbank takes the place of the coast reef; between the two is a channel of 13 fathoms depth, giving access to a basin of 17 fathoms water. This anchorage can only be safely reached by first sending two boats in, one to mark the edge of the coast reef, and the other the edge of the sandbank. The village Peore is situated between this anchorage and Tanjong Sausu.

Reefs and beacons.—Two dangerous reefs close together, with depths of $4\frac{1}{2}$ and $2\frac{1}{2}$ fathoms over them, lie on the edge of the 100-fathoms line, 318° true from Tanjong Sausu.

Lalanga reef lies 7 miles eastward of Tambu bay, and mostly dries; it is steep-to except on the east side, where there are three small drying reefs and a patch of $1\frac{1}{2}$ fathoms water. Six cables to the southward is a ring-shaped reef, marked by a beacon with red ball.

Pasir Laut (Haarlemmermeer) (*Lat. 0° 47' S., Long. 120° 55' E.*) dries over an area about $2\frac{1}{2}$ cables in diameter, and is very steep-to; at high water it is entirely covered, but can be clearly seen by surf

General charts 2636, 941b, 942a, 1263, 2759a.

Chart 2636, Strait of Makassar, north part. Var. 2° 40' E.

and discolouration. It is marked by a beacon with black truncated cone. The S.S. *Rochussen*, in 1912, reported a shoal with $3\frac{1}{2}$ fathoms water about $3\frac{1}{2}$ miles, 342° true, from the beacon.

Nearly 5 miles northward of Tanjong Sausu is a small coral reef that partly dries at low water; it is marked by a beacon with red ball topmark. Fully 6 cables westward is a reef of 2 feet water.

Coast.—Between Tanjongs Sausu and Pondindilisa, a distance of 7 miles, the hills near the coast are high, attaining a greatest height in Mount Pondindilisa, 1,314 feet, the northern extreme of a long ridge easily distinguished from a north-west direction. Between Tanjongs Pondindilisa and Makatata, a distance of 12 miles, the coast forms a bight, and is sparsely populated; there is a safe passage under the coast, but from 3 to 4 miles further out from each point, just inside the 100-fathoms line, are several shoals, nearly all drying at low water. A beacon with black truncated cone marks the outer edge of a reef 3 miles northward of Tanjong Pondindilisa.

Tindaki village is not visible from seaward; there is safe anchorage close off the mouth of the river, in 20 fathoms. Fresh water can be obtained from the river.

Tanjong Makatata is a slightly projecting point, and easily recognised. The coast reef extends 2 cables from the point, and there is a navigable passage 3 cables broad between it and a large reef to the northward; the southern edge of the latter reef is marked by a beacon with white ball. A number of reefs lie inside the 100-fathoms line to 5 miles northward of the point; the northern of these is marked by a beacon with black truncated cone. Westward of the point is a small bay, with anchorage close off the Sungi Dolago; the bottom here is, however, very steep.

Plan of Parigi road on 2194.

Parigi road (*Lat. $0^\circ 48'$ S., Long. $120^\circ 11'$ E.*).—The large village Parigi, the residence of the official governing the Parigi division, can be seen a great distance from eastward; it is situated about 4 miles inland, on the Sungi Parigi, and is encompassed by earth walls. The village Loji, with the ruins of an old fort built about 1730, is situated on the shore, 3 miles north-westward of Tanjong Makatata.

The bottom is very steep, leaving little anchoring space in the road. Steaming for Parigi road, with 40 fathoms of cable out, the anchor will take in fairly good holding ground opposite a break in the coast reef, and very close to this reef. The north-east point of the coast reef southward of the anchorage is marked by a beacon with black truncated cone. In very unfavourable circumstances the road is not safe.

General charts 2636, 941b, 942a, 1263, 2759a.

Chart 2636, Strait of Makassar, northern part. Var. 2° 40' E.

Directions.—From Poso or Mapane to Parigi there are two routes, outside the 100-fathoms line or inside the barrier reef between Tanjongs Sausu and Pondindilisa. With little knowledge of the coast the outer passage is generally taken, as it is well beaconed and presents no difficulty; the red beacons are left on the starboard hand, the black beacons on the port hand.

For the inshore passage, from the red beacon on the reef southward of Lalanga, course 307° true is steered to pass 2 miles off Tanjong Sausu, and for Tanjong Pondindilisa when bearing 290° true, entering the channel between the barrier reef and the coast on this course; the southern of these reefs will be passed at about 6 cables distance. Tanjong Sausu is then brought astern on the bearing 129° true, steering 309° true until the nearest point of land westward of Pondindilisa bears 236° true; from this position the next point will be just visible behind. The course here is 255° true, steering for Tindaki village; when the southern ridge of Mount Pondindilisa bears 124° true it is kept astern, with course 304° true, thence passing through the channel between Tanjong Makatata and the beacon on the reef northward of it.

Plan of Labua Sore on 2194.

Labua Sore.—Between Parigi and Labua Sore, 11 miles to the northward, the 100 - fathoms line runs within a mile from the coast, with a number of reefs inside. Anchorage can be obtained in 35 to 40 fathoms 1½ cables off-shore in Taboli roads. Labua Sore, conspicuous by a hill 886 feet high, affords a very safe and sheltered anchorage for vessels of moderate size. It is formed by a gully in the coast reef, about half a cable wide at the entrance, with 4 fathoms least water, increasing to 11 to 16 fathoms inside; the bottom consists of sand and coral.

Plan of Ampibabo road on 2195.

Ampibabo road.—This part of the coast is conspicuous by two dome-shaped mountains in the interior, 5,424 and 4,872 feet high. The village Ampibabo, 11 miles northward of Labua Sore, is situated on the southern side of the point of that name; the wooded coral islets Dongkala and Dii (*Lat. 0° 27' S., Long. 120° 5' E.*) lie near the point; the trees on the latter are visible 10 miles. Besides these islets are numerous reefs, which dry at low water, and can generally be plainly seen. There is good anchorage off the village; steering in with Tanjong Ampibabo bearing 5° true will clear the reefs, anchoring in about 17 fathoms, with Dongkala islet just open of the coast.

Chart 2636, Strait of Makassar, northern part.

Coast.—Between Ampibabo and Turibulu, a distance of 9 miles, there is a broad strip of low land in front of the high mountains, and

General charts 2636, 941b, 942a, 1263, 2759a.

Chart 2636, Strait of Makassar, northern part. Var. 2° 40' E.

the bottom is less steep than southward of Ampibabo. From southward, Tanjong Turibulu is sharply defined against the high mountain land, and has a cocoanut plantation on its extremity (view at page 516). The village is situated on the southern side of the point, and the bottom here is very steep, although coast vessels anchor about $1\frac{1}{2}$ cables from the shore, steering for the mouth of the rivulet on the bearing 235° true. There is better anchorage in the small bight northward of Tanjong Turibulu.

Eastward of Donggulu village, where the chief of Kasimbar resides, a reef of 3 fathoms water lies 3 cables off-shore, and is the only detached reef from 3 miles southward of Turibulu to 3 miles southward of Kasimbar. Kasimbar is a small coast village, with anchorage off it in 24 fathoms. A large partly-drying coral reef lies southward of the road, 3 cables from the shore, and a reef fully $1\frac{1}{2}$ miles eastward of the village is marked by a beacon with white ball. Between Donggulu and Kasimbar is a mountain with an arched summit, 3,544 feet high.

The small bay in which the village Taäda is situated is dangerous on account of the large number of reefs in it, but there is no coast reef here, and the drying part under the coast consists of sand. Vessels anchoring off the village must keep close along the northern shore with a westerly course. Good water can be obtained from the rivulet.

Tanjong Sene, seen from Kasimbar or a northerly direction, is a prominent point covered with trees of moderate height; the village of the same name is situated just northward of the point. The prince of the Sigenti district resides at Menelili, a village situated on a low, flat tongue of land, showing up clearly against the mountains; the Dutch flag is generally hoisted by his house when vessels are sighted. Many reefs lie off the village; the anchorage is east-south-eastward of it, in about 28 fathoms.

Tanjong Lemo (*Lat. $0^\circ 8' N.$, Long. $120^\circ 8' E.$*) very much resembles Tanjong Sene, except that it projects further. There is anchorage in 15 fathoms in the bight southward of the point, off the village Labua. Northward of Tanjong Lemo the 100-fathoms line approaches the coast again. There is good anchorage off Sidoa in 15 fathoms; a reef of one fathom water lies northward of the road, 2 cables off-shore. Northward of the village is a hill close to the coast, 177 feet high, and conspicuous from north and south.

Off Tanjong Silabia, 16 miles north-eastward of Tanjong Lemo, the coast reef projects a considerable distance; there is anchorage southward of the point, off Dongkasa, and northward, off Tenombo, where the Rajah of Moutong generally resides. Tanjong Tenombo can be

General charts 941b, 942a, 1263.

Chart 2636, Strait of Makassar, northern part. Var. 2° 30' E.

easily recognised by a very high tree and a dark clump, appearing as an islet at a distance. Fresh water may be obtained from the rivulet.

Tanjong Pelasa, 11 miles north-eastward of Tanjong Silabia, is a low, outstanding point covered with trees; a reef of 2 fathoms water, marked by discolouration, lies fully 2 miles, 121° true, from the point.

Raaf reef, with a depth of 3 feet over it, and about 30 yards in diameter, lies 5 miles to the southward of Tanjong Pelasa; it is very steep-to, and is marked by a beacon with black truncated cone.

Caution.—Between Raaf reef and Tanjong Pelasa two reefs of 2½ and 4½ fathoms of water are reported to lie between 2 and 5 miles from the point; caution should, therefore, be exercised in this vicinity, and vessels should keep close to Tanjong Pelasa when navigating between Tenombo and Tomini.

Plan of Tomini road on 2718.

Tomini road (Lat. 0° 30' N., Long. 120° 32' E.). — Tomini, 7½ miles eastward of Tanjong Pelasa, consists of a number of hamlets situated on a plain about 4 miles broad; a road leads over the mountains to Dondo bay, a distance of about 36 hours. Tomini peak, 5,862 feet high, rises north-westward of the village, but is of little use for bearings. The anchorage is off the west part of the village, with the flagstaff bearing about 0° true: eastward of the anchorage are two reefs of 7 and one fathom water.

Charts 2636, Strait of Makassar, northern part, and 942a.

NORTH SHORE OF THE GULF OF TOMINI.—

The coast from Tomini to Tanjong Tuladenggi, a distance of 35 miles, is flat and wooded, except between Tanjong Tabolööh and the Sungi Bolano, where the mountains approach the coast. The conical peak of Santigi, 1,004 feet high, is conspicuous from all directions (view at page 516), and near Lambunu there is a conspicuous reddish hill in the foreground, 102 feet high. There are few noticeable features in the high mountains inland, and the summits are generally hidden by clouds in the morning. There are few inhabitants along this part of the coast, and except for the village Mogogondo (Lambunu), which is occasionally visited by steamers, there are no places of any importance.

Islands and dangers between Tomini and Tuladenggi.—A great number of dangers lie between Tomini and Tuladenggi, and the 100-fathoms line does not sharply define the edge of the barrier of reefs, as is generally the case in the gulf, several reefs having been found outside; it is possible that further dangers may

General charts 2636, 941b, 942a, 1263.

Charts 2636, 942a. Var. 2° 30' E.

exist, so that vessels must keep a sharp look-out in the daytime, and pass well to the southward at night. As there are no trading places on the coast between Tomini and Santigi, the principal object of the survey here was to find a serviceable passage between the reefs, and outside this it has not been fully examined. The chart must be consulted for the position of the dangers.

Numerous uninhabited coral islets lie along the edge of the 100-fathoms line. Bongka lies close under the coast, about midway between Tomini and Tanjong Taboloöih (view at page 516). Southward of Tomini are Giombang, Tangah Tangah, Simogalien, Tobongi, Laäson, and Saluton; owing to its position and size Giombang is a useful bearing point, and Saluton, 20 miles off-shore, can be easily recognised by a large tree on it. A small drying reef, about 5 miles, 105° true, from Saluton, is marked by a beacon with white ball, and a reef of 1½ fathoms water lies 1½ miles southward of it. Southward of Taboloöih is the conspicuous islet Uluë, and south-eastward of Tanjong Santigi are the three low islets Sama, Ala, and Tongoani; Sama and Ala are thickly wooded.

The passage between the reefs westward of Santigi is easier to navigate than that eastward, as although there are a greater number of reefs, many of them dry and afford leading marks; eastward of that point there are a number of small reefs with a few feet of water over them, not easily seen.

Plan of Lambunu road on 2718.

Lambunu road (Lat. 0° 25' N., Long. 120° 59' E.) affords very good anchorage in 12 fathoms. The Sungai Belano, a salt-water creek, is about 1½ miles westward of the anchorage.

Chart 900, Tilamuta harbour to Tanjong Tuladenggi.

Tanjong Tuladenggi may be recognised by some cocoanut trees and a remarkable high tree further inland. The village Tuladenggi is situated on the river of that name, navigable for large praus. A partly-drying bank of mud and sand projects 3 cables from the point, with some detached reefs southward of it (*see* chart). The reefs near the 100-fathoms line are all marked by discolouration, and there is a very distinctive dry sandbank on the reef 6½ miles southward of the point. There is anchorage in 18 to 20 fathoms, mud, off the mouth of the river, which splits into two channels.

Chart 942a, Eastern archipelago, eastern portion.

Directions.—The inshore passage from Lambunu road to Tuladenggi requires the utmost caution, and is not recommended, as although it has been carefully examined unknown dangers may exist. For the outer passage the course is 218° true, with the conspicuous red-

General charts 941b, 942a, 1263.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 30' E.

dish hill near Lambunu bearing 38° true astern (view at this page), thence outside the islets Sama and Ala, and crossing the 100-fathoms line again about one mile westward of Tongoani; a safe course from here is 56° true for Tuladenggi.

Chart 900, Tilamuta harbour to Tanjong Tuladenggi.

From southward course may be steered to pass westward of the dry sandbank $6\frac{1}{2}$ miles southward of Tuladenggi; there are then no further dangers except the reefs close southward of the point, which are easily seen.

The coast from Tanjong Tuladenggi to Tanjong Panjang (*Lat. 0° 24' N., Long. 121° 48' E.*), a distance of 40 miles, has a very mountainous appearance, the hill spurs closely approaching the shore, leaving here and there a narrow strip of marshy, densely-wooded land, with occasional sandy beaches. The land is scantily inhabited, and the only villages of importance are Muton and Papajatu.

Along the edge of the 100-fathoms line there extends a barrier of islands and reefs, more or less absent in places, and broken through by many navigable passages, giving access to a belt of enclosed water of moderate depths, also studded with islets and shallows, which can seldom be approached by the lead, and liable to be hidden by discoloured water discharged by many streams. These inner passages should not be used by those unacquainted with local features.

The most conspicuous of all the islands is Puntu, 8 miles north-westward of Tanjong Panjang; the summit, 911 feet high, appears like a crater, and can be seen from about 20 miles eastward, and nearly as far west as Muton. Puntu Kiki, 241 feet high, is not conspicuous, and is difficult to distinguish from the coast. The remainder of the islands are low. Dulangka is covered with brushwood and a few very high trees; outside the 100-fathoms line, a mile south-eastward of Dulangka, is a coral reef with a sandbank on it, which partly dries at low water. Iloluta and Ilosangi are wooded, but not so thickly as Sadii and Sadaä; near the north side of Dodepo is a high-tree projecting above the others; Lamuu Daä and Lamuu Kiki are covered with high trees of an equal height.

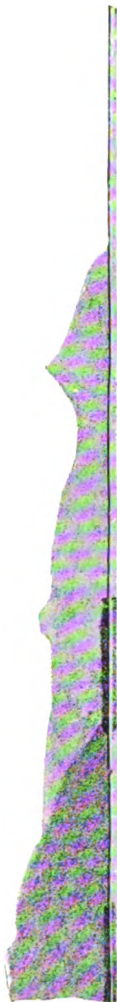
Mountains.—From Mount Pinditi, about 15 miles northward of Tanjong Tuladenggi and 7,383 feet high, a long ridge of considerable height runs to the south-eastward and then curves eastward to Mount Marissa, a saddle mountain attaining a height of 2,771 feet in the western part. The most noticeable peaks of this range are Muton and Njo, 5,453 and 3,327 feet high, respectively. From this high mountain chain several lower spurs approach the coast, but the summits of these are not always readily seen on account of the

General charts 942a, 1263.



Tanjong Turibulu from Dongkaka.

Gulf of Tomini, west shore.



Bongka, S. side bearing 100° true.

Santigi peak.

Gulf of Tomini, north shore.

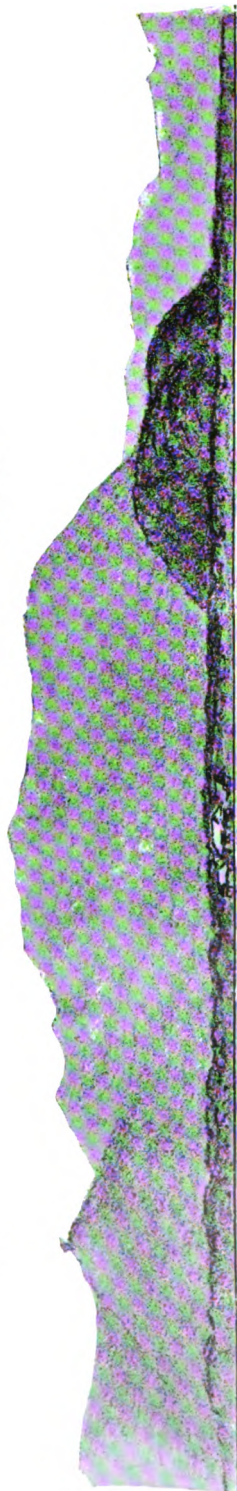


Red hill, bearing 38° true.

Gulf of Tomini, north shore; Lambunu approach.

1 929 ft.

W. summit. *Mt. Marissa.* *E. summit.* *Mt. Dingki.*



House with conspicuous zinc roof.

West summit of Mt. Marissa in line with zinc-roofed house in Papajatu, bearing 318° true.

Gulf of Tomini, north shore.

Chart 900, Tilamuta harbour to Tanjong Tuladenggi. Var. 2° 30' E. proximity of the higher mountains. The principal of these are Mount Salompingan, with three sharp summits, the northern and highest 2,860 feet; Lobo and Bolu (Boloö), 2,298 and 3,096 feet high, respectively; and Alalang, with two peaks of 1,511 and 1,447 feet.

Northward of Papajatu is Mount Dingki, an isolated saddle mountain 1,093 feet high, showing up clearly against the background on account of its light green colour; Zaagberg, further inland, is 2,879 feet high. Mount Beu, 2,397 feet, is the highest summit of a group of mountains from which a spur runs to the coast. Lumuli, 1,806 feet, has two trees on the top showing well above the surrounding wood; Brown hills, so named on account of their colour, are three in number; the two southern are the most noticeable. Angorasse hill, 468 feet high, on the peninsula of that name, has two summits of a peculiar brown colour. Naim, Patilangio, and Litu Litu, with several other less noticeable peaks, form a long chain of mountains; Mount Ulotta, 3,027 feet, is further inland.

Maluangi and Panabean (*Lat. 0° 16' N., Long. 121° 15' E.*).—Panabean, a small round islet covered with high trees, lies on the north-east point of a large reef 13 miles to the southward of Muto. From the island the reef runs to the south-south-westward for 2 miles, with two large drying places, and then bends to the westward, forming a narrow ridge 4 miles long, with irregular depths of one to 9 fathoms and some drying places. The reef is very steep to on the south side, no bottom being found at 256 fathoms. About 1½ miles westward of Panabean is a small detached reef partly drying.

Maluangi is larger than Panabean, and also covered with high trees; the reef round the island is very steep except on the south-west side. Two and a half miles westward of Maluangi is the south point of a large reef, with depths ranging from a half to 6 fathoms over it; this reef is also very steep.

The area between these reefs and the edge of the 100-fathoms line westward has not been accurately examined.

Plan of Muto road on 2194.

Muto road.—The village Muto is situated on a little rivulet of fresh water, which can be entered by small vessels at high tide. The primitive dwelling of the Rajah is on the beach, but the proper village is further inland. The wooded islet Lalaijo lies 1½ miles to the southward. The anchorage is in about 13 fathoms, 6 cables from the shore. For reefs near the road, see plan.

Chart 900, Tilamuta harbour to Tanjong Tuladenggi.

Directions.—From seaward the course to Muto is between Maluangi and Dulangka. Mount Dingki in line with the north side

General charts 942a, 1263.

Chart 900, Tilamuta to Tuladenggi, plan 2194. Var. 2° 30' E.

of Dulangka, bearing 36° true, and Mounts Muton and Bolu in line, 358° true, lead clear of the reefs of Panabeen and Maluangi, on the western side; on the eastern side of the channel the south summit of Salompingan in line with the south edge of Lalaijo, bearing 311° true, clears the reefs by Dulangka islet. This channel is clear until 3 miles, 104° true, from Lalaijo, where there is a small coral reef of 2 fathoms water; the west side of Panabeen in line with the east side of Maluangi, 189° true, leads eastward of this reef, steering for the beacon with white ball, on the southern side of a drying reef eastward of Muton when sighted. The south summit of Salompingan in line with Muton flagstaff, bearing 294° true, leads to the anchorage.

Plan of Pajonge anchorage on 2718.

Pajonge anchorage.—The village Papajatu (*Lat. 0° 29' N., Long. 121° 29' E.*) is built on piles, and the neighbourhood is marshy. There is little to be obtained beyond eggs, fowls, cocoanuts, and bananas; the exports are forest produce. The anchorage is southward of the village, in 12 fathoms, with the summit of Puntu island in line with the south side of Lamuu daä. Small vessels find good anchorage in 5 fathoms at the northern end of the passage between the Pajonge islands.

Chart 900, Tilamuta harbour to Tanjong Tuladenggi.

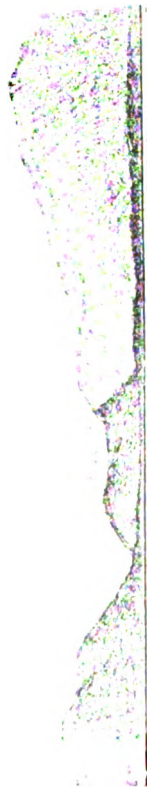
Directions.—The usual channel to Pajonge anchorage is through the 3-cables broad passage between the reefs projecting from Sadaä and Dodepo, with the west summit of Mount Marissa over a house with zinc roof in Papajatu bearing 316° true (view at page 516); the edges of these reefs are not marked by discolouration. There are three houses with zinc roofs in the village, but the westernmost is not very conspicuous; the other two are close together, and the western of these is the one to be used for the leading mark. This mark leads close along the Sadaä reef, so that when this island is two points before the beam it is advisable to bring the summit a little to the right of the house.

Other passages westward, leading to Pajonge anchorage, are:—The 5 cables broad passage between the reef of Sadii and the 2-fathoms reef westward, with a conspicuous cleft on the west slope of Zaagberg in line with the north-east summit of Dingki, 351° true (view at this page). Also between Sadii and the drying part of the reef westward, in 4½ fathoms least water, with Mount Naim over the north side of Lamuu kiki, 53° true (view at this page); this mark also leads southward of the bank south-east of Dulangka.

Between Dodepo and Pasejogo there is a passage about one cable broad, with fairly regular depths of 5 fathoms; the saddle between the

General charts 942a, 1263.

Conspicuous cleft.



N.E. summit, Dingki.

Cleft on W. slope of Zangberg in line with N.E. summit of Dingki, bearing 351° true.

Conspicuous tree.



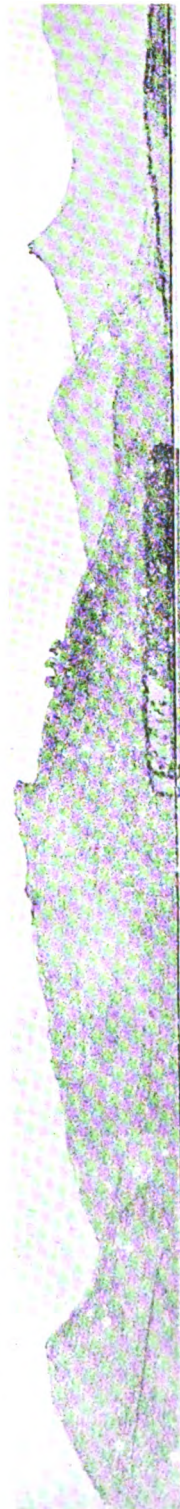
N.E. summit, Dingki.

Tree on W. slope of Zangberg in line with N.E. summit of Dingki, bearing 2° true.

Haaitand.

Mt. Naim.

Podilangio.



Lamuu daai.

North side of Lamuu kiki.

Mt. Naim in line with the north side of Lamuu kiki, bearing 53° true.

Paselpogo.

Saddle.



Tanjong Tolosaije.

Mt. Salompingan.

High tree.

Saddle between N. and middle summits of Mt. Salompingan in line with high tree E. of Tanjong Tolosaije, bearing 277° true

Gulf of Tomini, north shore.

Chart 900, Tilamuta harbour to Tanjong Tuladenggi. Var. 2° 30' E. northern and middle summits of Mount Salompingan in line with a conspicuous high tree eastward of Tanjong Tolosiaje, bearing 277° true, leads through the middle of this passage. View at page 518.

Inner passage between Muton and Papajatu.—There is a broad passage between the coast and the islands and reefs, situated near the 100-fathoms line, providing the shortest route from Muton or Molosipat to Papajatu; the reefs and shoals in this channel can easily be avoided by following the directions given below. Three points on the coast are easily recognised: Tanjong Popadenggo, near Molosipat; Tanjong Dudeulu (*Lat. 0° 28' N., Long. 121° 24' E.*), with a village close to a group of cocoanut trees; and Tanjong Tolosiaje, a wooded point, with a high tree near the shore standing above the others.

Besides the passages between the reefs already given in the directions for Pajonge anchorage, there is another channel between Ilosangi and the 2-fathoms reef eastward, giving access to the inshore passage. This can only be used when the reefs are clearly seen, with a remarkable tree on the western slope of Zaagberg in line with the north-east summit of Dingki, bearing 2° true. View at page 518.

Directions.—From Muton road the course for the inshore passage to Papajatu is 86° true, with Tanjong Popadenggo in line with the summit of Puntu island; this mark leads southward of a small coral reef of 2 fathoms and northward of a reef of 3 feet least water a little further eastward. When the south side of Sadaä is seen in line with the north side of Sadii, this mark is steered for with course 99° true, passing southward of a shoal of one fathom least water southward of Tanjong Dudeulu, a reef of 4½ fathoms, and a large sandbank, the eastern part of which dries; northward of two reefs of 4 and 2 fathoms water, and an extensive coral reef which dries in two places, situated nearly 1½ miles southward of Tanjong Dudeulu. When Mount Naim is seen between the coast and Pajonge island, it is steered for with course 64° true, passing close southward of Tanjong Tolosiaje and over the deepest part of a reef of 4 fathoms least water lying southward of that point; thence for the anchorage.

From Muton direct to Papajatu an easier route is with the south summit of Salompingan over Muton flagstaff, bearing 294° true, astern, and then with an easterly course northward of the islands Iloluta and Ilosangi, and southward of a shoal of 1½ fathoms lying 2½ miles 164° true from Tanjong Popadenggo; thence for Papajatu with a north-easterly course.

The bay between Papajatu and Tanjong Panjang is studded with islands and reefs with navigable passages between, but as the shortest

Chart 900, Tilamuta harbour to Tanjong Tuladenggi. Var. 2° 30' E. route to Papajatu from eastward is outside the 100-fathoms line, they are of little importance for European vessels, and no directions will be given here.

The coast from Tanjong Panjang to Tilamuta harbour forms no bays of importance, except Tilamuta, where there is very good anchorage. The land is very mountainous, the spurs approaching the coast, and leaving generally a narrow low strip of densely wooded, usually swampy, land, about half a mile wide. The most conspicuous points are Panjang and Bululiho (*Lat. 0° 27' N., Long. 122° 9' E.*).

Along the whole of this part of the coast a barrier of islands and reefs lies just within the 100-fathoms line, which is from 2 to 6 miles off-shore; between this barrier and the islands and reefs under the coast is a broad passage with only a few isolated reefs in it, easily avoided. The depths in this channel vary from 12 to 30 fathoms, occasionally a little more, and anchorage can be found everywhere. There are no dangers outside the 100-fathoms line, but vessels navigating in deep water must keep well to the southward.

Mountains.—The following summits are conspicuous (view at this page):—

Furthest inland are the Dapi mountains, a very conspicuous range; the two highest summits are 4,937 and 5,542 feet.

Mount Olionuhe, 2,362 feet high, northward of Tanjong Panjang, stands by itself and is particularly remarkable; between it and the Dapi mountains is Lambuluto, of 2,968 feet.

Mount Iloa, 2,707 feet high, is a tolerably steep cone.

Mount Timboale Sirupu has a rounded summit, 3,622 feet high, with two lower summits east and west.

Mount Dulantangan, 1,796 feet, is the highest summit of a ridge running about 2 miles from the coast.

Mount Tiolo, 3,352 feet, is the highest summit of a long chain, and has two peaks with a dip between.

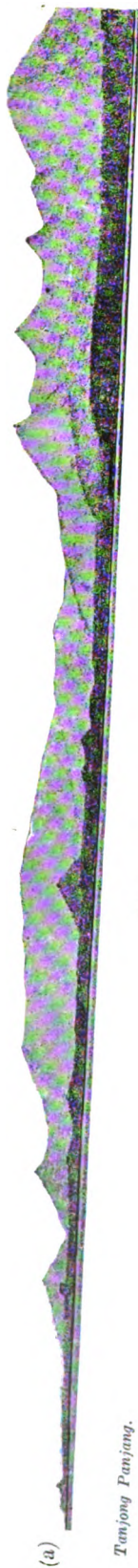
Tanjong Panjang can be very easily recognised by a group of high casuarina trees near the shore. The eastern of the two reefs south-eastward of the point dries at half tide, and is plainly visible by discolouration and surf.

Sungi Randangan, which discharges by the point of the same name about 7 miles eastward of Tanjong Panjang, is the principal river on this part of the coast. It has three mouths, forming a swampy delta; the western of these has depths of 15 to 18 feet, and a breadth of about 40 yards. The depths on the bar before the mouth are not more than 4 feet, and a rise of tide of 3 feet can be reckoned on. West-

General charts 942a, 1263.

Mt. Solompingan. *Mt. Bola.* *Mt. Muton.*

Mt. Naim. *Mt. Patilangio.*



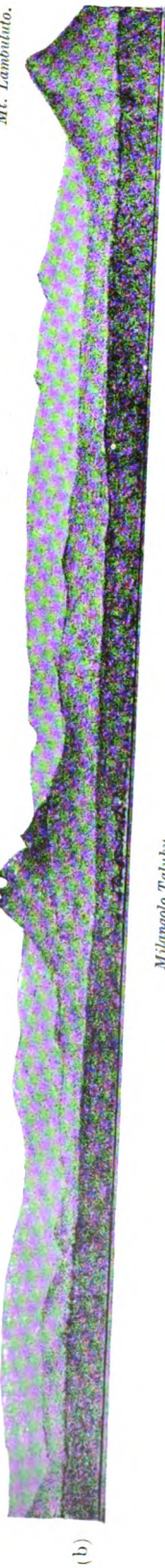
Tanjong Panjang.

Puntu.
Mt. Olionuhe.

Mt. Timbonte.
Tanjong Randangan.

Mt. Litu Litu.

Mt. Lambululo.



Milangolo Taluhu.
Dapi mountains.

5,542 ft.



Mt. Timbonte Sirapi.

Mt. Iola.

Mt. Tiolo.

Pomolia dai.

Mt. Dulantangan.



Pomolia kiki.

Gulf of Tomini, north shore; Tanjong Panjang to Tomelo, from Iobani. *Pentadu.* *Tomelo.*

Chart 900, Tilamuta harbour to Tanjong Tuladenggi. Var. 2° 30' E. ward the Sungi Boila and Telenanga discharge through marshy land; they join the Randangan further inland.

Milangolo Talulu road (*Lat. 0° 26' N., Long. 121° 56' E.*).—The village Milangolo Talulu is built on piles near the mouth of the Sungi Botudulanga. A few provisions at high prices can be obtained, and fresh water from the river. The anchorage is southward of the mouth in 14 or 15 fathoms, with Pomoliia daä bearing 87° true.

Directions.—There are three routes to Milangolo Talulu road from seaward. The western is with Mount Timboale Sirupu over the river mouth, bearing 41° true, and passes westward of a beacon with black cone marking a reef of three-quarters of a fathom water. This reef is not easily seen owing to the turbid water from the Sungi Randangan; a reef of 4 feet water lies westward of the beacon, close to the leading mark.

The middle channel is between the beacon and the wooded islet Lahei, with Mount Lambuluto over the mouth of the Sungi Botudulanga, 359° true.

The third channel is eastward of Lahei with the Mount Tafel northward of Tanjong Tambu (Tamboö) between the Pomoliia islands, 12° true, until Mount Litu Litu is over the mouth of the Sungi Botudulanga, bearing 304° true; this latter mark leads to the road. Mount Litu Litu has a round summit, and is the first mountain seen after the low part west of Olionuhe. Pomoliia daä is 103 feet high and partly cultivated; Pomoliia kiki is low (view at page 520). On the west side of this channel discoloured water was seen 6 cables eastward of Lahei island.

Pentadu road.—Pentadu, 6 miles eastward of Pomoliia kiki, is one of the principal villages on this part of the coast; the dwellings are scattered, and have an unimportant appearance. There is good anchorage off the village in 5 to 7 fathoms. Southward of the road lie several reefs (*see* chart), making the approach somewhat difficult; vessels passing here should keep well on the southern side of the inner channel.

Provisions are scarce and dear; water is obtained from the river.

Directions.—From westward Mounts Timboale Sirupu and Dulantangan in line, bearing 7° true, leads through the barrier, and the south-east side of Tomelo, 66° true, leads to Pentadu road, between two reefs of 2½ and 2 fathoms.

From southward there are two passages, either east or west of the thickly-wooded island Bitila. Except with local knowledge the passage west of Bitila can only be used when the reefs are clearly seen, passing fully one cable westward of the discolouration on the reef projecting from that island. The passage eastward is broader,

General charts 942a, 1263.

Chart 900, Tilamuta harbour to Tanjong Tuladenggi. Var. 2° 30' E. and is marked by a beacon with black cone on the south-east point of the reef from Bitila. Mount Dulantangan over the river mouth, 316° true, leads between two reefs of 3 and 5 fathoms, or the passage between the beacon and the 5-fathoms reef may be taken. When inside the barrier vessels must turn as quickly as possible to bring the village on the bearing 0° true, steering in on that course, which leads westward of a reported reef about 2½ miles north-westward of Bitila, but over a patch with 9 fathoms water. Caution is necessary as uncharted rocks may exist.

Tanjong Bululiho (Buloöliho) (*Lat. 0° 27' N., Long. 122° 9' E.*).—By Tanjong Bululiho the hills approach the coast; on the extremity of the point is a wooded hill, joined by a lower ridge to a hill 527 feet high, the highest summit of the spur.

Channel west of Montoli.—Between Montoli, 5 miles east-south-eastward of Tanjong Bululiho, and the reef westward there is a passage about half a mile broad, fairly easy to navigate when the reefs are seen. The Montoli reef projects 2 cables on the west side, and fully 3 cables from the north-west point; vessels should steer close along this reef, taking care to sound not less than 12 fathoms. A clump of casuarina trees, 4 miles eastward of Tanjong Bululiho, bearing 357° true, may be used as a mark. Montoli is a thickly-wooded island; Montoli kiki is a sandbank with a few trees and shrubs.

The village Petadaä, 4 miles eastward of Tanjong Bululiho, is of little importance; two reefs of 4½ and 4 fathoms lie close under the coast, and further outside there is a reef of 3½ fathoms. There is anchorage westward of the village, where a beach takes the place of the coast reef; the depths decrease very rapidly inside the 10-fathoms line, and vessels should not anchor in less than 15 fathoms.

Passage between Telefoa and Mopingulo.—Between Telefoa, 4½ miles eastward of Montoli, and two reefs of 3 and 3½ fathoms eastward there is a serviceable passage giving access to the inner channel. This passage is half a mile broad in the narrowest part; the course through is 345° true from 2 to 2½ cables off Telefoa; one of the dwellings of Batumuito village is a useful mark to steer on, and the reef round the island is always seen. Telefoa and Tangulumato are little more than sandbanks with a few trees and shrubs on them; the passage between these two is not recommended.

Plan of Tilamuta harbour on 2195.

Tilamuta harbour affords very good but confined anchorage in 20 fathoms. The shores are mostly covered with mangroves; the village Tilamuta, consisting of a few houses in gardens, is situated at the back of the bay. There is a good landing place for boats by

General charts 900, 942a, 1263.

Plan of Tilamuta on 2195. Var. $2^{\circ} 30'$ E.

the houses near the right bank of the river. The marshy island Tapata daä lies on the west side of the bay, separated from the coast by a narrow channel with depths of 2 to 4 feet; the coast reef projects about a mile southward, with the islets Tapata kiki and Asiangi on it.

Chart 900, Tilamuta harbour to Tanjong Tuladenggi.

The eastern entrance to the inner channel between the coast and the islands and reefs near the 100-fathoms line is just before the entrance to Tilamuta harbour. On the north side are the extensive coast reef around the islet Lahengo, a detached coral reef of $3\frac{1}{2}$ fathoms, and further westward the islets Asiangi, Libiata, and two small reefs of one fathom least water. On the south side are the thickly wooded islands Mohupombo daä, Mohupombo kiki, and Mopingulo. The east point of Mohupombo daä is a very remarkable red rock; a beacon with black cone marks the northern edge of the reef projecting from the island.

Directions.—From eastward two small houses on the point eastward of Tanjong Bajasa, open north of Tapata kiki, 277° true, leads in; when the east point of Mohupombo daä bears 191° true the harbour may be entered by steering for Tilamuta village, or a course taken south-westward into the inner waters, between Asiangi and Mohupombo daä.

Plan of Dulupi road on 2718.

Dulupi road, 6 miles eastward of Tilamuta, is formed between Dulupi island and the coast, and affords good anchorage in the north monsoon; in the south monsoon it is necessary to move into one of the inner bays, where space is very restricted. The shores of the bay are covered with mangroves in most places. The village Dulupi is situated near the mouth of a rivulet opposite the entrance; the river cannot be reached by boats, but there is a very good landing place westward of the village. The anchorage is 3 cables southward of the village, in 20 fathoms. Entering the bay attention must be paid to the reef projecting from the east side of Dulupi island; when the reefs are not seen, or in thick weather, it is not advisable to enter the inner bays.

Plan of Limba bay on 2718.

Limba bay (*Lat. $0^{\circ} 30'$ N., Long. $122^{\circ} 32'$ E.*) is formed by the high, densely-wooded Pulo Limba and a tongue of land eastward, the south-west point of which is called Tanjong Bobaä. The entrance, between the steep reefs projecting from Limba and Tanjong Bobaä, is a little more than a cable wide, and the anchorage space inside is only 3 cables across, but there is sufficient room for three moderate-sized vessels, in about 20 fathoms water. There is shelter in both monsoons.

General charts 942a, 1263.

Plan of Limba bay on 2718. Var. 2° 30' E.

No rivers discharge in the bay, and probably for that reason the climate is very healthy. Water can be obtained from a spring near the village. Much timber is exported.

Chart 942a, Eastern archipelago, eastern portion.

Bobaä bay is a small inlet, eastward of Tanjong Bobaä, affording excellent anchorage in 22 fathoms. The passage between the reefs at the entrance is only 2 cables wide, but the reefs are clearly marked by discolouration. The village Bobaä is situated in the upper part of the bay; vessels load timber here, which is brought off in bamboo rafts.

Plan of Pagujama river entrance on 2718.

Pagujama bay, where the river of that name discharges, is about 8 miles eastward of Limba; the depths are very great, in the middle of the bay a sounding of 310 fathoms was obtained. Anchorage may be found for a small vessel close to the mouth of the river, with a stern hawser to the trees. The village Bilatu is situated here, and is the loading place for praus taking forest produce to Gorontalo.

Plan of Gorontalo river on 2195.

Gorontalo, 22 miles eastward of Pagujama, is situated on the tongue of land formed by the junction of the Sungis Bolango and Bone, the principal streams of the Gorontalo river, that with a narrow mouth, forming the harbour of Gorontalo, discharges into the bay of the same name. On both sides of the mouth are steep mountain ridges, with a wide plain between them at the junction of the Bolango and Bone. The mouth of the Gorontalo river is very deep, but about 3 cables inside the depths suddenly decrease, and further it is only navigable for very small vessels. The town is large, and well built; in the middle stands Nassau fort, now occupied by the police force. Near the fort is the residence of the Government official of the division. The roads are well kept and lighted.

The population numbers fully 6,000.

LIGHT (Lat. 0° 30' N., Long. 123° 3' E.).—A white group flashing light, showing groups of three flashes every thirty seconds, thus: light, three seconds; eclipse, three seconds; light, three seconds; eclipse, three seconds; light, three seconds; eclipse, fifteen seconds, is exhibited, at an elevation of 95 feet above high water, from a white iron framework, 46 feet high, situated on the left bank of the river. It is visible from a distance of 10 miles, but westward of the bay is obscured when bearing eastward of 48° true by Tanjong Kaju Bulang.

The road is limited on the south side by the line from Tanjong Batu Lajar to the lighthouse, and affords poor anchorage on account of the great depths and strong current; there is only room for a small

General charts 942a, 1263.

Plan of Gorontalo river on 2195. Var. 2° 30' E.

number of vessels. In the south monsoon, especially in July and August, a strong wind blows in the daytime, causing a heavy sea and allowing little opportunity for vessels to anchor on the west side of the road. On the east side vessels obtain shelter by lying as close as possible to the shore. The land breeze begins about 6 p.m., and the sea is then calm.

The best berth is in a small bight on the east side, off the sheds of the Royal Netherlands Steam Packet Company; there are three mooring buoys here, and vessels bring a stern hawser to some buried anchors, hauling close under the shore. Schooners and small coast vessels usually moor southward of this place.

Vessels can moor further inside close to the bank of the river, dropping the starboard anchor in 8 to 10 fathoms, veering 45 to 60 fathoms cable, and dropping the port anchor in about 30 fathoms; a small stern hawser may be brought to the eastern shore.

There is also anchorage outside the river, with the lighthouse bearing from 12° to 34° true, distant one to 1½ cables; the coast reef here is very steep.

As there is little space for manœuvring in the road, vessels entering by night should first ascertain how the ships already in the road lie.

Climate.—In the south monsoon the temperature is generally below 70° Fah. in the morning, and seldom rises to more than 85° Fah. during the daytime. In the north monsoon the temperature is higher, and the north-west winds, blowing over the swampy land round Limboto lake, are liable to cause fever.

Trade.—The exports are forest produce, wax, skins, tortoise-shell, &c. Imports are principally cotton and copper work.

Communication.—Vessels of the Royal Dutch Steam Packet Company call at Gorontalo (*Lat. 0° 30' N., Long. 123° 3' E.*) twice a month on the voyage from Surabaya and Makassar to Ternate, and every four weeks from Makassar to Gorontalo and back. There is a good road to Kwandang, on the north coast.

Telegraph.—Gorontalo is connected to Kwandang by telegraph, and thence to all parts of the world.

Supplies.—Provisions of all sorts can be obtained. There is no coal.

Tides.—*See* page 502.

Chart 942a, Eastern archipelago, eastern portion.

The coast from Gorontalo trends to the south-eastward for 21 miles to Tanjong Tombalilatu, and then runs in an east-by-north direction for 67 miles to Tanjong Flesko. This part of the coast is

General charts 942a, 1263.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 30' E.

very steep, and can be closely approached, the detached reefs in the eastern part all lie close under the shore; near Tanjong Dominango, 27 miles eastward of Tanjong Tombalilatu, the mountains near the coast attain a height of between 5,000 and 6,000 feet.

Tanjong Salongon (*Lat. 0° 21' N., Long. 123° 58' E.*) is low, but can be recognised from eastward by the large roof of the store sheds for forest produce. There is very good anchorage $1\frac{1}{2}$ to 2 cables from the shore in 13 fathoms, inside a $2\frac{1}{2}$ -fathoms patch. Vessels of the Royal Netherlands Steam Packet Company call here about every two months. The rivulets Salongon and Malibagu discharge near the point, and the village Malibagu, where the Rajah of the district resides, can be reached by a footpath.

Tanjong Tolu, 15 miles to the eastward, has a round hummock on the end; numerous reefs lie between these two points, but none of them are further than a mile off-shore.

Batu Tolu islands lie about 23 miles eastward of Tanjong Salongon; Pondang, the larger of the two, is separated from the coast by a narrow strait; Batu Tolu, the smaller, is surrounded by a drying reef.

Jiko Pasilangan is a deep, clean bay about 4 miles west of Tanjong Flesko, and affords excellent anchorage in the upper part, sheltered from all except easterly winds; at about $4\frac{1}{2}$ cables from the shore a sounding of 23 fathoms was obtained, the depths generally decreasing from there. The islet Kalapa (named Pulu Babi by the natives) is connected by a reef to the southern entrance point. Pondang (named Kalapa by the natives) lies before the entrance to the bay; on the south side of this island there is a large reef of very irregular depths, and three rocks above water on it.

LIGHT.—A white flashing light every thirty seconds, showing a flash of five seconds duration, is exhibited, at an elevation of 243 feet above high water, from a white iron framework, 72 feet high, situated on the south-western slope of Pondang island. It is visible from a distance of 22 miles. For the arc of visibility, see Light list.

Plan of Kettlewell bay on 930.

Jiko Bilangan (Kettlewell bay), immediately westward of Tanjong Flesko, is nearly a mile long, north and south, and nearly the same in breadth. The entrance points, which are about 500 feet in height, are about half a mile apart; a coast reef extends from the east point, the west side is clear and deep. There is very sheltered anchorage in the bight on the west side of the bay close to the shore, in 20 fathoms. Owing to the absence of streams of any size water is not obtainable.

General charts 942a, 1263.

Chart 942a, Eastern archipelago, eastern portion. Var. 2° 30' E.

Tanjong Flesko is rocky, and there is frequently a strong current and surf near the point. A large reef, with some rocks above water named Batu Mandi, lies eastward and northward of Tanjong Flesko, with a narrow channel of more than 10 fathoms water between. A small reef of 6 fathoms water, surrounded by great depths, lies about 2 miles southward of the point. The coast here turns to the north-north-eastward.

Laga islands are two small rocky islets lying at the extremity of a tongue of land jutting to the southward, 7 miles north-eastward of Tanjong Flesko; between the northern islet and the coast there is a passage of 2 fathoms least water, navigable for small vessels. The large village Nuangan is situated on the river of the same name in the bay west of these islets; there is anchorage before the mouth of the river in 25 fathoms, about $2\frac{1}{2}$ cables from the shore. Southward of this bay are two smaller inlets, Jiko Matabulu and Jiko Ho-ujoh, affording anchorage close under the coast.

Coast.—Jiko Buluntaja, 3 miles northward of the Laga islands, affords anchorage in 18 fathoms off the village Molobok, and there is also anchorage in 20 fathoms, about $2\frac{1}{2}$ cables from the coast, near the village Motongkat. There is restricted anchorage further northward in the small inlets Tehi and Dodap, but there are no villages here. The islet Bantong is joined to the coast by a drying reef, about one mile southward of Tanjong Salimburung, and a reef projects $1\frac{1}{2}$ cables eastward. In the small bight northward of Tanjong Salimburung there is anchorage in 20 to 23 fathoms, eastward of Telaga village, about $2\frac{1}{2}$ cables from the shore; there is a large conspicuous tree by the mouth of the rivulet. A rock awash at low water is charted off Telaga.

Bambajanon, 3 miles to the northward of Tanjong Salimburung, is separated from the coast by a clean channel, and is a very fertile island; maize and tobacco are cultivated.

Plan of Kota Buna road on 2194.

Kota Buna road (Lat. $0^{\circ} 48'$ N., Long. $124^{\circ} 39'$ E.), between Kumekeh island and the main coast, affords safe but confined anchorage in 12 to 15 fathoms abreast some cocoanut trees on Kumekeh. Just northward of Kota Buna village shoal water extends about $1\frac{1}{2}$ cables. The islet Ratjun, a rock with some low trees on it and shoal water 2 cables to eastward, lies about one mile eastward of Kumekeh.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Kota Buna every four weeks on the Surabaya, Makassar, North Celebes route.

General charts 942a, 1263.

Plan of Totok bay on 2718. Var. 2° 30' E.

Totok bay, 4 miles northward of Kota Buna, is spacious, and affords sheltered anchorage in both monsoons. The village Totok, on the west side, is of little importance, although there are several large godowns and a loading place belonging to the gold-mining company; from seaward the zinc roofs of the buildings where the ore is worked are conspicuous on the mountain slopes. The south side of the bay is formed by a narrow, hilly tongue of land running to the north-eastward, terminating in a reef with some rocky islets on it, the outer of which is named Dakokaju. Further to the north-eastward are the high, rocky islands Hogow and Tulang; the passage between these two should not be attempted. The bay can be entered between Tulang and the coast northward, or between Hogow and Dakokaju; both these channels are wide and clean. The saddle-shaped island Babi lies on the north side of the bay, with two rocks westward of it.

The anchorage is eastward of the loading place in 12 to 15 fathoms; the river north of the village generally makes the water a brown colour, so that the edge of the coast reef cannot be seen.

Communication.—Vessels of the Royal Netherlands Steam Packet Company visit Tokok every fortnight on the Surabaya, Makassar, North Celebes route.

Plan of Belang bay on 2194.

Belang road (*Lat. 0° 56' N., Long. 124° 47' E.*), 3 miles northward of Tulang, affords shelter during the greater part of the year, and vessels lie better here in southerly winds than at Kema. The village is fairly large, and some white houses with zinc roofs can be seen from a great distance. The anchorage is in 10 fathoms, nearly 2 cables from the shore.

Chart 2575, Eastern part of the Celebes sea.

Bentenan islands, 8 miles north-eastward of Tulang, consist of the islets Bentenan, Pakolor, and Punten, with several smaller islets and rocks. Pakolor, the outer islet, is 215 feet high; a rock with 3 feet water over it lies 2 cables to the south-eastward. In any swell or sea there are heavy rollers on this rock, and in calm weather its position is indicated by riplings. Bentenan is a saddle island, the eastern and highest summit being 500 feet; except on the east side it is surrounded by a drying reef, on which there is frequently a surf. Near the east side are four steep rocks, and southward of the island three small islets or rocks, of which Punten is the southernmost and is surrounded by an extensive reef.

The passage between Pakolor and Bentenan is clean and safe, although the water is very troubled with the wind against the stream.

General charts 942a, 1263.



Kema village.
Flagstaff 290' true. Mt. Klabat. Gunong Sudara. S.W. point.
Limbé island. Pulo Dua.

Kema and the coast of Celebes to the northward, from Kema anchorage.



Tanjong
Mokolamba.

Tanjong
Pusan



Mt. Klabat.

Gunong Batu Angus.

Gunong Sudara.

Straits of Banka, south shore.

(b)

Chart 2575, Eastern part of the Celebes sea. Var. 2° 30' E.

The passage between Bentenan and the coast is almost entirely closed by reefs. The coast between Belang road and Bentenan islands is clear except for an isolated reef southward of Minanga village, half a mile from the shore.

Coast.—From abreast the Bentenan islands to Kema, a distance of 26 miles, the coast is fronted by a drying coral reef projecting one to $1\frac{1}{2}$ cables, except immediately southward of Kema, where it is 3 cables broad; in northerly and easterly winds there is generally a heavy surf on the coast, and landing can only be effected in places where the coast reef is broken, where a strip of sand and a few houses and cocoanut trees are generally found. The only villages on this part of the coast are Bentenan and Rumbia, near the Bentenan islands; there is good anchorage at half a mile from the shore, with the latter village bearing 315° true. There are no outlying dangers.

Abreast the Bentenan islands the land is low, rising inland to the high volcanic group formed by Mounts Manimprok, Soputan, Sempo, and Kawatak. Smoke and vapour are sometimes seen issuing from these craters, and in July, 1907, Soputan ejected enormous columns of fire and smoke. Northward of these a densely wooded ridge, attaining a greatest height of 3,870 feet, runs about 5 miles inland, from which numerous spurs approach the coast, with occasional sandy beaches between.

Plan of Kema road on 2194.

KEMA (*Lat. $1^\circ 22'$ N., Long. $125^\circ 5'$ E.*) is situated on a plain at the foot of Mount Klabat (Kalabat), and forms a useful complementary port to Menado, according to the prevalent monsoon; in the north-west monsoon, chiefly in the months of December, January, and February, when Menado road is unsafe, vessels lie at Kema perfectly sheltered. A good carriage road connects the two ports, but the cost of transporting goods is high. Near Kema a small river discharges, the entrance of which is dry at low water. The breadth of the coast reef off Kema increases to the north-eastward, and off Tanjong Merah projects fully 6 cables; the depths on it are very uneven. View at page 528.

The road affords good anchorage through the greater part of the year, although open to winds from south to east. In the south-east monsoon, during the months of June, July, August, and September, the swell breaks heavily on the beach, but landing can always be effected in the southern part of the road, by the old coal sheds.

There is anchorage in 5 to 10 fathoms; in 6 fathoms water there is fair holding ground, with Mount Klabat bearing 330° true, and the gap between the two peaks of Gunong Sudara, 30° true. When approaching from southward vessels must avoid the reef extending from the south point of the bay.

General charts 2575, 942a, 1263.

Plan of Kema road on 219½. Var. 2° 30' E.

On the north side of the road, outside the 10-fathoms line, at a distance of $2\frac{1}{2}$ cables from the shore, is a detached rock with 3 fathoms water over it, one mile, 76° true, from the Kema river entrance.

Supplies.—Provisions of good quality can be obtained in small quantities. The water from the river is fit for use.

Communication.—During the north-west monsoon vessels of the Royal Netherlands Steam Packet Company call when they have passengers on board for Menado.

Tides.—The tides at Kema (*Lat. $1^\circ 22' N.$, Long. $125^\circ 5' E.$*) are mixed, with a preponderating double-daily character, most pronounced when full and change occurs about one day before 0° moon's declination; when the moon's greatest declination occurs about one day after the quarters the tide has a single-daily character.

The double-daily tide has springs fully one day after full and change, with high water at VIh. 30m., and a rise of over 3 feet; neaps occur the same interval after the quarters, with high water at the same hour, and a rise of 6 inches. About the second half of March and September the range of both springs and neaps is 6 inches greater; in the second half of June and December the range of springs is 6 inches less, while that at neaps is imperceptible.

The single-daily tide has high water on 1st January about IVh. 30m. p.m.; 1st April, Xh. 30m. a.m.; 1st July, IVh. 30m. a.m.; and 1st October, Xh. 30m. p.m. Springs occur shortly after the moon's greatest declination with a rise of 2 feet, neaps shortly after 0° moon's declination with a rise of 6 inches. About the second half of June and December the ranges are one foot greater, and about the second half of March and September the spring range is one foot less.

The high waters of the spring tides of both groups fall together when, about 1st June and 1st December, the greatest declination of the moon falls fully one day after full and change; the highest rise then is at VIh. 30m. a.m. and p.m. The low waters of springs do not occur together; the lowest water is reached in the first half of March and September, shortly after midnight and mid-day. When 0° moon's declination falls about one day after the quarters, the tidal movements are very weak for a few days.

Plan of North part of Celebes island on 930.

Limbé island is about 12 miles long north-east and south-west, and about $2\frac{1}{2}$ miles wide in the southern part. It is uninhabited and covered with thickly-wooded hills, attaining a height of 1,545 feet in the southern part; according to the inhabitants of the coast opposite there are numerous wild pigs and snakes on it.

General charts 2575, 942a, 1263.

Plan of North part of Celebes island on 930. Var. 2° 30' E.

Sandy island (*Lat. 1° 23' N., Long. 125° 10' E.*), encircled by a reef, lies about 7 cables westward of the south point of Limbé, and has two small trees on it; on the west and north sides the reef is very narrow, but on the south and east sides it extends from one to $1\frac{1}{2}$ cables. A small detached reef of $2\frac{1}{2}$ fathoms water lies 3 cables, 350° true, from the north point.

The south point of Limbé is formed by a narrow, hilly tongue of land; a reef extends 6 cables to the south-westward, and the whole of the south coast, in which are numerous inlets, is bordered by an extensive drying reef. Pulo Dua lies about midway along the south coast, and has two peaks, the highest being 310 feet; this islet is steep-to on the east side, but a narrow reef extends from the north and west sides. Pulo Susulina, lying close to the south-east point of Limbé, is about 120 feet high.

The east coast of Limbé is clifty and steep-to. The northern end of the island is very narrow, with a well-wooded range of hills about 600 to 700 feet high, precipitous and steep-to on both sides. The north point consists of large masses of black and red rock, covered with high trees and shrubs; outside the point are a number of detached rocks, against which the sea breaks heavily; the largest of these, named Batu Kapal, is 84 feet high, and white from bird droppings. Rocks extend for a further distance of 2 cables in a north-by-east direction; the outer rocks are about 6 feet high, and always show above water. The north-east point of the island is a wedge-shaped cliff about 200 feet high; this point and Batu Kapal may be rounded in safety at the distance of half a mile, but there is generally a strong tide race.

Plan of the Narrows, Limbé strait, on 930.

Limbé strait is narrow, and somewhat intricate; it is about 12 miles long, and in the middle there are some islets encircled by reefs with a channel on either side. The channel west and north of the islets is the best, being straight, and the reefs generally plainly visible.

In the southern approach to the strait the village Girian is situated on the Celebes shore, $1\frac{1}{2}$ miles northward of Tanjong Merah, and a very steep spit of $1\frac{1}{2}$ fathoms, sand and mud, extends 3 cables off the village. The southern narrows are clear, and inside the strait broadens, forming a basin with excellent anchorage in 17 to 20 fathoms, sheltered from all winds and sea.

Outside the southern entrance to the northern narrows is a patch of $4\frac{1}{2}$ fathoms, on the western side of the channel.

Tidal streams.—The flood stream sets northward through the

General charts 930, 2575, 942a, 1263.

Plan of the Narrows, Limbé strait, on 930. Var. 2° 30' E.

strait and the ebb southward, at the rate of 3 to 4 knots at springs in the narrowest parts; southward of the narrows, on the Limbé side, there is little stream. Springs rise 5 feet.

Plan of North part of Celebes island on 930.

Mountains.—Mount Klabat (*Lat. 1° 27' N., Long. 125° 2' E.*) is a very conspicuous cone standing by itself, rising to a height of 6,635 feet from a low base. Gunong Sudara, or the Two Sisters, has a double peak, the western 4,480 feet and the eastern 3,888 feet high. Gunong Batu Angus, 3,720 feet high, has a more rounded summit than Sudara; a crater has opened on the eastern slope about 2 miles from the summit and $1\frac{1}{2}$ miles from the sea. This is a truncated cone of loose ashes, 1,470 feet high, of regular shape, whence a small lava stream has issued, forcing its way through the forest to the sea. In 1907 this crater was devoid of all vegetation save a few patches of reeds.

During the south-east monsoon these mountains are generally entirely visible in the mornings, but are frequently hidden by clouds after 8h. a.m., although it was noticed that Klabat often remained clear while the mountains more eastward were covered.

Coast.—From the northern entrance of Limbé strait the coast trends in a north-westerly direction for 8 miles to some cliffs 300 feet high, pierced by curious caverns. The south-eastern part of this stretch is low, rocky, and thickly wooded, rising continuously at the back to the summit of Gunong Batu Angus. The north-western part consists of a long black sand beach with native huts on it. Two pillar rocks, 40 feet high, stand off the northern entrance point to Limbé strait, and a reef extends half a mile to the northward and eastward, with several rocks under water at its edge.

During the survey, the *Flying Fish* anchored in a small bay to the north of Tanjong Batu Angus, the north point of entrance to Limbé strait, in 17 fathoms, with Batu Kapal bearing 56° true, and the pillar rocks 156° true.

From the perforated cliff the coast trends in a north-by-easterly direction for 5 miles to Tanjong Puisan, and consists of long steep beaches of coarse black volcanic sand, the favourite resorts of those singular birds, the Maleos, which in the dry seasons deposit their eggs in the sand just above high-water mark. The country behind is hilly and wooded.

Pulo Mogogimbun is a small, wooded, conical island, 163 feet high, lying half a mile 74° true from the perforated point. The south side is steep and cliffy; a reef extends from its north side to about half

General charts 2575, 942a, 943, 1263.

Plan of North part of Celebes island on 930. Var. 2° 30' E.

a mile out, with several rocks upon it, two of which show just above high water; it breaks heavily with the least sea or swell.

Anchorage.—There is good anchorage in the bay west of Pulo Mogogimbun, protected from swell and southerly winds in 17 fathoms, shoaling gradually to 3 fathoms close to the beach. The *Flying Fish* anchored with Mogogimbun bearing 92° true, and Batu Bundita 22° true.

Pulo Kalinaon is an islet 250 feet high, wooded, and joined to the mainland by a reef which also extends nearly a quarter of a mile to the southward.

Batu Bundita (Pandita) is a sharp-pointed rock with a white top 30 feet high.

Tanjong Puisan (Cape Coffin) (*Lat. 1° 41' N., Long. 125° 10' E.*) is a bold point with large boulders off it, and a narrow fringe of coral which can be passed with safety at a quarter of a mile distance; there is generally a tide race off the point. From the cape, the land rises abruptly to a high tableland, 975 feet high, a mile long, and thickly wooded, easily distinguished from all sides by its square box-like aspect. Tanjong Mokotamba, 1½ miles to the westward of the north extremity, is steep and cliffy, about 200 feet high, and surrounded by huge boulders extending seaward about one cable; the water is shoal about 2 cables from this point. View at page 528.

Banka island, 6½ miles long and 4½ miles wide, is thinly populated, of irregular shape, and densely wooded, with the exception of several clear spaces of coarse grass. The summit is on the eastern side, 1,140 feet above the sea; to the west of it are several round-topped conical hills, ranging from 600 to 800 feet high. The north point of the island is formed by low mangroves; a rock 14 feet above water, named Batu Kapal, rises at 2 cables from the point, and is connected with it by a coral reef. Tanjong Batu Goso, the eastern point of the island, is a sharp conical hill, 266 feet high, wooded, and joined to Banka by a low neck of land. To the north-east the point ends in a succession of sharp needle rocks, the outermost of which are surrounded by water, and are 15 to 20 feet high; off Tanjong Toto, 1½ miles to the southward, there are also some rocks above water.

In Jiko Sago there is anchorage in about 20 fathoms, half a mile from the shore; the south side of this bay is formed by a narrow tongue of land with an extensive reef projecting to the southward, on which are Pulo Sahaong and several rocks above water, against which the sea breaks.

The south point of Banka is a low cliffy point, rising to a conical hill 280 feet high; there are heavy tide rips off the point, and a

General charts 2575, 943, 942a, 1263.

Plan of North part of Celebes island on 930. Var. 2° 30' E.

wide berth should be given it. The west coast of the island is low, and fringed by coral, extending about a cable from the shore.

The western point of the island is a low dark red cliff with trees; north-eastward is a bay with soft muddy bottom, which is the only place among these islands where a ship can be beached. To enter it a boat should go ahead, as the entrance is intricate and narrow; a small stream falls into the head of the bay.

Kinabohutan island (*Lat. 1° 50' N., Long. 125° 6' E.*) is low and wooded, with a sort of terrace about 60 feet high on its southern side. It is surrounded by a reef half a cable wide and steep-to off the south-east point, extending to a third of a mile from the east shore, while on the north-west side it nearly joins the reef of Talisei island, leaving only a channel of 3 fathoms depth, too narrow and intricate to be used for ships. The channel between Kinabohutan and Banka is 3 miles long and one mile wide; the tidal streams in it are sometimes very strong, but are not perceptible on the eastern shore.

Talisei (Talissee) is a high narrow island nearly 6 miles long, with a central peak 1,175 feet high. It is thickly wooded, with patches of cleared land, and occupied, with Kinabohutan, by the Molucca Trading Company, who have laid out extensive cocoanut plantations; the copra from these islands fetches a high price. A species of iron-wood is also grown here, which will give straight piles 100 feet long, good for piers; but it is too heavy for spars or for ships' use, and will not float in sea water.

The north-east point of the island, Tanjong Aros (Arus) is a bold cliff with large broken rocks at the base, and steep-to; the tidal streams run with violence round the point, with tide rips and eddies. Along the west side of the island the coast reef dries out to about one cable, with the 10-fathoms line about 3 cables from the shore. The south-west point, Tanjong Bung, is of sand and mangroves with a great square rock off it, 10 feet above water; the reef off extends a quarter of a mile. The south-east point is a sand spit, with a reef off it which projects 2 cables eastward. From the south-east point to Talisei road, a distance of 2 miles, the shore is low, covered by mangroves and fringed by a reef one to 1½ cables wide.

LIGHT.—A *white flashing light every five seconds* is exhibited, at an elevation of 354 feet above high water, from a *white iron framework*, 65 feet high, situated on Tanjong Aros. It is visible from a distance of 25 miles. The duration of the *flash* is *half a second*. For the arc of visibility, *see* Light list and plan.

General charts 2575, 943, 942a, 1263.

Plan of Talisse road on 930. Var. 2° 30' E.

Talisei road, between the south-east part of Talisei island and Kinabohutan, affords good anchorage in 10 to 12 fathoms, with the flagstaff bearing 309° true, and the west tangent of Kinabohutan 47° true. This position is between the mole and a reef of 4½ fathoms; eastward of this reef is a small bank of 8 fathoms water. There is a stone mole with a shed at the end, but only boats can lie alongside. The house of the manager of the Molucca Trading Company is near the mole; the flagstaff in front of it is 70 feet high.

North-eastward of the mole the coast reef extends gradually further out, until a quarter of a mile from the mole the depth at about 1½ cables from the shore is 1½ fathoms, steep-to; and at about 6 cables eastward from the mole there is a patch detached from the Kinabohutan reef, with less than 6 feet on it, and with one spot awash, towards which the flood stream sets strongly. Tanjong Puisan in line with the western extreme of Banka, 148° true, leads westward of the latter shoal.

Light (*Lat. 1° 50' N., Long. 125° 5' E.*).—A red fixed lantern light, visible 2 miles, is shown from a pole at the end of the mole at Talisei on the arrival of ships.

Coal.—There is a Government coal depôt of about 6,000 tons capacity; 5,000 tons of Welsh coal are usually in stock. Coal can be loaded at the rate of about 200 tons per day.

Communication.—A vessel of the Royal Netherlands Steam Packet Company calls at Talisei every four weeks.

Supplies.—No provisions are obtainable. Good water is obtained from a spring near the manager's house.

Tides.—On the east coast of Talisei the tide is mixed, with a strongly predominating double-daily character.

The double-daily tide has springs about half a day before full and change, with high water at VIh. 30m., and a range of 6 feet; neaps occur about half a day before the quarters, with high water XIIh. 30m. and a range of nearly 1½ feet.

The single-daily tide has high water on 1st January, about IVh. p.m.; 1st April, Xh. a.m.; 1st July, IVh. a.m.; and 1st October, Xh. p.m.; springs fall fully one day after the moon's greatest declination, with a range of 2 feet; neaps the same interval after 0° moon's declination, with a range of 6 inches.

The high and low waters of spring tides of both groups cannot fall together.

The highest tides occur about 1st December at VIh. 30m. p.m., and 1st June at VIh. 30m. a.m.; the lowest about 1st September at Oh. 30m. p.m. and 1st March at Oh. 30m. a.m. The tidal movement is weakest when 0° moon's declination falls about 1½ days before the quarters.

General charts 930, 2575, 943, 942a, 1263.

Plan of North part of Celebes island on 930. Var. 2° 30' E.

Tindila island is half a mile long north and south, and 2 cables wide; the northern part is rocky and has a clump of trees on it 250 feet above the sea; the southern part ends in a wide beach of white sand. A reef extends from it 4 cables to the westward. The channel between Tindila and Talisei is 4 cables wide, 8 to 15 fathoms deep, and clear of all danger. The channel between Tindila and Ganga is only fit for boats.

Ganga island is about $1\frac{1}{2}$ miles long and half a mile wide, rocky and wooded, with a hill about 330 feet high in the southern part. The eastern side is steep-to, but the southern and western sides are fringed by a reef, while the southern extreme is surrounded by a bank which slopes gently from 4 to 10 fathoms depth, plainly marked by discolouration. It is advisable to give a wide berth to this point, as the flood stream to the westward sets directly on to it, then branching to the northward and westward. Ganga is inhabited, Tindila and Lihaga are not.

Lihaga (Lat. $1^{\circ} 46' N.$, Long. $125^{\circ} 2' E.$), a small wooded islet to the westward of Ganga, is 109 feet high, and fringed by a narrow reef steep-to on all sides but the northern, from which shoal water extends to 2 cables. The channel between Lihaga and the nearest part of Celebes is $1\frac{3}{4}$ miles wide.

STRAIT OF BANKA or LIKUPANG, 12 miles long from Tanjong Pusan to Tanjong Papalempungan, presents no difficulties; vessels under 20 feet draught steer a straight course from one entrance point to the other, which leads north of Korrier rock, while vessels of greater draught may pass through in not less than 8 fathoms by following the directions given further on. The water is generally very clear, and the bottom can often be seen in 8 to 10 fathoms in a calm sea. View at page 528.

Shoals in Banka strait.—Korrier rock is of white coral, covered by 3 fathoms least water, and is generally indicated by tide rippings; the shoalest part is a quarter of a mile long, and is very flat: from it Ganga summit bears 324° true, distant $4\frac{1}{4}$ miles. The shoal is steep-to on its east and south-east sides, and shelves gradually to the northward and westward: on the west side are lumps of mushroom coral.

Except for the reefs inside the line joining Tanjong Bohoi and the point east of Likupang, depths of 5 to 10 fathoms were found recently on all the banks and shoals (except Korrier rock) lying in the strait. The 4-fathoms patch, charted $1\frac{7}{10}$ miles, 17° true, from Likupang village, was not found, but it probably exists, although no discolouration was seen. All reefs can be seen in clear weather at a distance of half a mile.

General charts 2575, 943, 942a, 1263.

Plan of North part of Celebes island on 930. Var. $2^{\circ} 30' E.$

Tidal streams.—The flood stream runs westward fair through the strait between Tanjong Puisan and Banka island at the rate of 2 to 3 knots at springs. It divides off the south point of Banka, and later to the south-east of Ganga island, part continuing to the westward, turning to north-west and north after passing Tanjong Papalempungan; the remainder turns to the northward, running to the north-west through the passages between Ganga, Tindila, and Talisei, and to the north between Talisei and Banka. The flood stream on the west side of Talisei runs due north, and, meeting the stream from between Talisei and Banka, forms a tide-rip which is met with 3 miles to the north-west of the north point of Talisei. The ebb stream runs between the islands to the south-east and fair through Banka strait. Tide-rips are formed off all the salient points, and there are heavy races to the northward and north-eastward of Banka.

Plan of Likupang road on 930.

Likupang road (*Lat. $1^{\circ} 41' N.$, Long. $125^{\circ} 4' E.$*), on the Celebes coast, is well sheltered during the south-east monsoon, and free from the swell that is felt at Talisei anchorage during that season.

Likupang town, on the west side of the mouth of the rivulet of the same name, is of little importance, and is in communication with Menado and Kema by a good road. The river is very shallow, and at low water boats cannot approach within a quarter of a mile of the beach. The two points eastward of the river are covered with trees to the edge of the water; the shore here is fringed by coral, and shelving. At $1\frac{1}{2}$ miles east of this last point there is a pyramidal black rock, 18 feet high, connected at low water with a steep clifly point about 300 feet high.

Anchorage.—The best anchorage is in 7 to 9 fathoms, sand, with the middle of the village bearing 204° true, distant $1\frac{1}{4}$ miles, and Tanjong Bohoi 314° true; small vessels can anchor close in, but care must be taken not to shut in the 18-foot rock by the east point of the bay, as the ground inside is very foul.

Supplies are scarce, and only to be had in small quantities; the water in the river is good.

Communication.—There is postal communication twice a week to Menado, overland.

Plan of North part of Celebes island on 930.

Pulo Tamperong.—Westward of Likupang are two low islets, the largest of which is Tamperong, and several shoals, reefs, and drying sandbanks, extending to a distance of nearly 2 miles from the coast; the shore and islets are clothed with mangroves and fringed with coral.

General charts 2575, 943, 942a, 1263.

Plan of North part of Celebes island on 930. Var. 2° 30' E.

Tanjong Bohoi, opposite to Ganga island, is a low rounded point with trees on it 100 feet high, similar to Tanjong Papalempungan, and fringed like that point by a reef about 65 yards wide, on which the trees grow out beyond high-water mark. The 10-fathoms line is distant about $3\frac{1}{2}$ cables from the point, and the water is often of a greenish colour there. One mile west of Tanjong Bohoi is the entrance to a small circular bay, $1\frac{1}{2}$ to 2 cables in diameter, with a depth of 8 fathoms in the middle, but the entrance is closed by a reef on which the depth is 9 feet. There are a few houses and gardens on the shore of the bay.

Tanjong Papalempungan or Torawitan (North cape) (*Lat. 1° 45' N., Long. 124° 59' E.*) is rocky and thickly wooded to the water's edge, the tops of the trees being about 100 feet above the sea. The land slopes gently upwards from the point to a hill 825 feet high, one mile to the southward, which is the general height of the land at the same distance from the shore all along the north coast. The point is fringed by a coral reef about 40 yards wide and very steep-to, and on its eastern side there is a beach of white coral.

DIRECTIONS for BANKA STRAIT.—From eastward.—From Tanjong Pusan, which may be passed at a quarter of a mile distance, steer for the gap between Ganga and Tindila islands till the north-eastern extreme of Talisei and the western point of Banka are in line, and do not open them till the south extreme of Nain island is just touching Tanjong Papalempungan, bearing 277° true; then steer on that line, which will lead clear of all dangers. If intending to anchor at Likupang, Tanjong Makotamba, the point next westward of Tanjong Pusan, should be passed at half a mile distance; the course should then be altered to the southward till the rocks off the point are in line with Tanjong Pusan, 87° true, and continued on these marks to the anchorage.

From westward.—Tanjong Papalempungan may be passed at a distance of a quarter of a mile, and then a course 97° true, keeping the south end of Nain island just touching Tanjong Papalempungan, will lead clear of all dangers, with 8 fathoms least water, until the north-east end of Talisei and the west point of Banka are in line; a course may then be steered to pass a quarter of a mile from Tanjong Pusan.

If intending to anchor at Likupang, after passing Tanjong Papalempungan a south-easterly course should be steered, and Tanjong Papalempungan should not be brought to the northward of 300° true until the east extreme of Talisei is in line with the west extreme of Kinabohutan, when a 160° true course will lead to the anchorage. The latter course, however, may lead close to or over the position of the 4-fathoms patch previously mentioned.

General charts 2575, 943, 942a, 1263.

Plan of North part of Celebes island on 930. Var. 2° 30' E.

Proceeding for Talisei, the south point of Ganga island must be given a berth of three-quarters of a mile.

To make for Talisei anchorage by the passage between Talisei and Tindila from the west a mid-channel course should be taken between the reefs off these islands, which show well, steering 90° true, and for the anchorage when Lihaga is seen between Tindila and Ganga.

To pass through the channel between Banka and Kinabohutan from the northward, the lead should be kept going, taking care not to sound less than 10 fathoms, and the west point of Banka island (a red cliff topped with trees) steered for with course 180° true, until the flagstaff at Talisei is in line with the south extreme of Kinabohutan; then steer 219° true until the east extreme of Talisei is in line with the west extreme of Kinabohutan, which leads southward to the strait, or keep about half a mile off the coast of Banka. To anchor at Talisei, steer for the road with Talisei flagstaff bearing 292° true.

WEATHER.—In July, August, and September, in Banka strait, the general direction of the wind was between south-south-east and south; force 2 to 3 during the day; light air and calms at night; a few showers occurred but there were no really wet days. There was one gale from the southward, force 4 to 6, which lasted 48 hours, and generally a squall out of Limbé strait. The weather was never very clear, except in the early morning, and the tops of the mountains were generally in clouds. In the latter part of August, and in September, it became thicker, and during the latter part of September, the land was seldom seen more than a few miles. The average temperature was 82° Fah.

Plan of Kora Kora inlet on 2194.

NORTH COAST OF CELEBES.—Kora Kora bay (Lat. 1° 44' N., Long. 124° 58' E.) lies about one mile southward of Tanjong Papalempungan and penetrates about 1½ miles to the south-eastward. The entrance between the reefs on either side is only about three-quarters of a cable wide. There is good sheltered anchorage in about 20 fathoms, black volcanic sand, with the western entrance point bearing 300° true, and Mount Klabat 170° true.

Plan of North part of Celebes island on 930.

Coast.—From Kora Kora bay the coast trends to the south-westward for 14 miles to Tanjong Pisok, and is low and covered with mangroves to the water's edge. It is broken by several creeks in which there are fishing villages, and is bordered by a generally narrow reef except in the bight immediately southward of Kora Kora bay, which is almost completely filled by it. Talawaän village is situated at the mouth of the river of that name, northward of which is a hill 1,330 feet

General charts 930, 2575, 943, 942a, 1263.

Plan of North part of Celebes island on 930. Var. 2° 30' E.

high. Off the village Kima are three shoals of 2 to 3 fathoms water, the only off-lying dangers. Mount Tumpa, $2\frac{1}{2}$ miles eastward of Tanjong Pisok, is 2,140 feet high.

Anchorage.—There is anchorage in the bay in front of Kima village, within the three reefs mentioned above, in from 28 to 18 fathoms. The bay is sheltered by the islands lying off Tanjong Pisok and by the hills eastward of that point, and the water is always sufficiently smooth when landing at Menado is impracticable. The three reefs outside the bay are difficult to recognise by discolouration, especially in the north-west monsoon. The passage between the two western reefs is nearly $2\frac{1}{2}$ cables wide, with a least depth of 18 fathoms; the south point of Siladeng island, bearing 288° true astern, leads in. Two beacons stand on the shore northward of Kima; the rear beacon has a triangle, the front beacon a diagonal cross, as topmark, and these in line also lead to the anchorage inside the reefs in 24 fathoms, or farther up the bay in 18 fathoms, with a hawser to the shore near Kima. A beacon with ball topmark stands on the drying coast reef that projects from the point near Wori village.

Nain island, 11 miles westward of Tanjong Papalempungan, is one mile long north and south, and about half a mile wide; when seen from east or west it appears saddle-shaped, the northern summit being the highest, 630 feet above the sea. The island is surrounded by a coral reef 4 cables broad on the north side, and one to $1\frac{1}{2}$ miles broad elsewhere. The reef, which is very steep-to and marked by breakers and tide rippings, encloses a lagoon containing several coral patches with deep water between them; the *Flying Fish* steamed round the reef, but could find no deep entrance. On the eastern side, within the lagoon, is the wooded islet Nain kechil, 118 feet high. On the west side of Nain is a considerable village and many cocoanut plantations.

Manterawu is a flat coral island, covered with trees about 100 feet high, and surrounded by a reef which has depths of from 2 to 8 fathoms outside the edge in places, increasing rapidly to over 100 fathoms. The reef dries at low water, and is narrow in the southern part of the island, but extends $1\frac{2}{10}$ miles on the north side; on the north-west point of the reef, where the German vessel *Mathilde* stranded in 1886, a large anchor will be seen at low water. There are several houses on piles on the northern part of the reef and some mangrove islets. The channel between the reefs extending from Nain and Manterawu is three-quarters of a mile wide, deep and clear.

Siladeng island (*Lat. $1^\circ 38' N.$, Long. $124^\circ 48' E.$*) is low, surrounded by a reef from one to 2 cables wide, and has a white sand

General charts 2575, 943, 942a, 1263.

Plan of North part of Celebes island on 930. Var. 2° 30' E.

beach on its eastern side. It is nearly covered with cocoanut trees, and has a village on the west side.

Bunakeng island, $3\frac{1}{2}$ miles southward of Manterawu, is about 3 miles long east and west, and crescent-shaped, with a bay on the south side. It is low, but gradually rises up to a round-topped hill, 360 feet high in the western part. There are cocoanut plantations in several places. A steep-to reef of coral and sand surrounds the island, extending about 6 cables southward of the south-western and westward of the south-eastern points. The principal village is near the south-east point of the island; elsewhere are only scattered houses.

Menado Tua, $1\frac{1}{2}$ miles westward of Bunakeng, is a very steep circular island about 2 miles in diameter, and rises to a height of 2,695 feet in the form of a truncated cone, having the appearance of a volcano. It is surrounded by a steep-to fringing reef, 3 cables wide on the north side, but narrow elsewhere. On the slopes of the island are cocoanut plantations. Besides a few isolated huts there is a village of 30 to 40 houses on the south-east side.

The channels between these islands are clear and deep, and can be safely navigated when the reefs are seen.

MENADO BAY is about 7 miles wide between Tanjongs Pisok and Kalasei, and extends eastward 4 miles; the depths are very great except close under the shore. The reef projects 4 cables westward of Tanjong Pisok, is steep-to, and the greater part dries at low water; the reef continues as a narrower fringe along the whole shore of the bay. Off Tanjong Tokabene, 4 cables southward of the lighthouse, a shoal spit, on which is a beacon with a white ball, projects to a distance of $3\frac{1}{2}$ cables.

Plan of Menado road on 930.

LIGHT (Lat. $1^{\circ} 29' N.$, Long. $124^{\circ} 50' E.$).—A white group occulting light showing groups of three eclipses every thirty seconds, thus:—light, fifteen seconds; eclipse, three seconds; light, three seconds; eclipse, three seconds; light, three seconds; eclipse, three seconds, is exhibited, at an elevation of 42 feet above high water, from a white iron framework, 39 feet high, situated on the beach to the southward of the mole. It is visible from a distance of 10 miles.

Road.—The road is limited on the north side by a 283° true line from a beacon situated about 4 cables northward of the mouth of the river; on the south by a 283° true line from the lighthouse, and extends $3\frac{1}{2}$ cables from the shore.

In the daytime anchorage is prohibited (except for Government ships) between the bearings 113° true of the lighthouse and ball beacon abreast Tanjong Tokabene; at nights, southward of the light-

General charts 930, 2575, 943, 942a, 1263.

Plan of Menado road on 930. Var. $2^{\circ} 30'$ E.

house bearing 113° true. The 10-fathoms line is very close to the coast reef, although the bottom is not so steep by Tanjong Tokabene reef; anchoring there is not advisable, as rocks or coral lie at great depths.

Although the bay is spacious and free from danger, the road affords an insecure anchorage, at any rate during the north-west monsoon, from November to the latter part of April, and especially in the months of December, January, and February. The wind then blows with great force, with heavy squalls from W.N.W. and N.W. (known by the Malay name "Barat"), bringing such a high sea and swell as to entirely interrupt communication with the shore. Steam vessels should be prepared to leave at short notice, and take shelter in Banka strait. A dark lead-coloured sky to seaward is an almost certain indication of the approach of these squalls. From November to April sailing vessels should proceed to Kema, on the eastern side of the peninsula, whence goods are conveyed overland to Menado.

During other months of the year, except in September and October, squalls will come very suddenly from both land and sea, but they are local, of short duration, and cause no swell.

During the south-east monsoon strong southerly winds, called "Selatan," will sometimes blow for some days, without being overcome by the sea breeze.

Mooring buoys.—In the northern part of the road three mooring buoys are laid out so that the sterns of vessels already anchored can be moored. The direction wherein the anchor must be let go is indicated for each of the three buoys by two marks, which must be brought in line with each other, as follows:—Northern buoy, two rectangular figures; middle buoy, two discs; southern buoy, two equilateral triangles. In the southern part of the road are two sets of buoys, each set consisting of an outer and inner buoy, intended for small craft and Government steamships.

Directions.—When nearing the road, vessels lower an anchor down with 45 to 50 fathoms of chain, and approach one of the buoys very slowly with the landmarks in line until the anchor holds; the cable is then veered sufficiently and the vessel swung round on the anchor, and a stern hawser secured to the buoy.

Menado (*Lat. $1^{\circ} 30'$ N., Long. $124^{\circ} 50'$ E.*), the chief town of the Minahasa district and the seat of the Residency, is situated on the southern side of the mouth of the Sungai Menado. It is of very pleasing appearance, and extends in two long tree-planted avenues parallel with the shore; the native villages are also models of order and neatness. In the European part is the fort New Amsterdam, an old stone

General charts 930, 2575, 943, 942a, 1263.

Plan of Menado road on 930. Var. 2° 30' E.

building surrounded by a moat. Northward of the fort are the European shops, and the Chinese quarter is on the southern bank of the river; the opposite side is inhabited by the poorest part of the population, mostly Mohammedans. Mounts Klabat and Lokon can both be seen from the road. The population is about 10,000. Menado is a free port.

The Sungi Menado, which has its origin in the northern end of Tondano lake, is narrow and very shallow, and only navigable for light praus over a short distance. At high water small craft drawing not more than 5 feet can enter the mouth, and lie aground in safety.

Mole.—Southward of the mouth of the river a mole is built out, 475 feet long and 10 feet wide, broadening at the extremity. There is a landing place for boats on the south side of the head of the mole, but at low water springs only skiffs or flat-bottomed boats can go alongside, and landing is frequently difficult owing to the outset from the river and swell; in a heavy swell landing is more easily effected on the beach or inside the river.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Menado every fortnight, both on the outward and homeward routes between Surabaya, North Celebes, and Gulf of Tomini; also every four weeks from Makassar to Menado, calling at intermediate ports on the west coast of Celebes. There are good roads to the principal places of the Minahasa district.

Telegraph.—Menado (*Lat. 1° 30' N., Long. 124° 50' E.*) is connected by cable to Java, viâ Kwandang, Balik Papan, and Banjarmasin. Another cable is laid to Yap, whence there is communication with Shanghai, Honolulu, and San Francisco.

Climate.—The climate is very healthy; infectious diseases are seldom known. The nights are cool, but with strong land winds it is necessary to be on one's guard. Rain falls in abundance during a good part of the year; the driest months are August and September. (*See Appendix.*)

Trade.—The value of the imports in 1909 was £359,681, and of exports £540,618. The principal articles of import are earthenware and glass, flour, iron and steel, machinery, provisions, rice, yarn, &c. The chief articles of export are canes, coffee, copal, copra, dammar, ebony and other woods, maize, and nutmegs.

Supplies.—Provisions of all kinds can be obtained in very limited quantity and at a high price. Water can be obtained from the river, but boats must go well up the stream beyond the first bend to obtain it pure; it can be delivered alongside at 1'80 florins per ton.

General charts 930, 2575, 943, 942a, 1263.

Plan of Menado road on 930. Var. 2° 30' E.

A water conduit, from which vessels can supply themselves with washing and boiler water free of charge, is laid from a well in the vicinity to the extremity of the pier.

Tides.—During the month of June two tides a day were observed, with high water, full and change, at VIh. The minimum range was 2 feet, 2 to 3 days after the quarters; the maximum was 7 to 8 feet, 2 days after full and change.

Chart 2575, Eastern part of the Celebes sea.

The coast between Menado bay and Amurang gulf, a distance of 17 miles, is hilly, with a sharp summit 2,305 feet high southward of Tanjong Kelapa (*Lat. 1° 25' N., Long. 124° 37' E.*); eastward of this ridge is Mount Lokon, 5,200 feet high, with four peaks. Between Menado bay and Tanjong Kelapa there is only a narrow coast reef, except by Tanjong Mokupa, where it projects half a mile. In the bay between Tanjongs Mokupa and Kelapa are the villages Mokupa, Tanawangko, and Pupo (Poöpo). Between Tanjong Kelapa and Tetapaän the coast is fringed by a broad drying reef, extending nearly 2 miles off-shore, with several detached reefs outside, all very steep, but plainly marked by discolouration. There are some deep inlets in the coast reef, in one of which the village Arakan is situated. Between Tanjong Kelapa and Tetapaän the coast should not be approached within 3 miles.

AMURANG GULF is about 8 miles wide at the entrance, between Tetapaän and Tanjong Walentau, and penetrates about the same distance eastward. It presents an inviting panorama of wooded and cultivated hills, with the elevated mountains of the interior in the background. Tetapaän is a low, thickly-wooded island, and lies, with four rocks, on the drying reef projecting from Tanjong Batu Tindung. Eastward of Tetapaän is a little inlet in the reef affording shelter for small craft. Tanjong Mobongo, on the west side of the road, bearing 144° true, or a round-topped tree in line with a hill (view at page 544), 137° true, lead clear of the reef by Tetapaän; the latter mark is not very easily found, but Tanjong Mobongo can be seen from a great distance outside the bay. On the northern shore of the bay is another small inlet, named Pelabuhan Luak, which affords shelter for small vessels against the "Barat."

Plan of Amurang bay on 2194.

Amurang road.—From the southern shore of the gulf a broad, short tongue of land projects, forming an inner bay eastward, with Amurang road in the south-western part. The roadstead is safe during the whole year, but, as at Menado, the bottom is very steep, and it is necessary to secure astern with a landfast.

General charts 2575, 942a, 943, 1263.



Mt. Sempo. Mt. Sopotan.

Hill.

*Round-topped tree.
Hill in line with round-topped tree, bearing 137° true.*

Amurang. Mouth of the Rano Rapo.

Amurang gulf.



Molosso.

Tanjong Mariri

Tikus, bearing 109° true, 2 m.

Bolang Uki bay.

(a)



Celebes, north coast; Bolang Uki bay.

Tanjong Malela.

Tundonia.

Tenga.

Paniki.

b)

Plan of Amurang bay on 2194. Var. 2° 30' E.

The best anchorage is in 40 fathoms, about a cable's length from the beach, with the flagstaff of the old Lunet bearing about 148° true. Vessels should approach the shore with about 40 fathoms of chain out, veering to 90 and 95 fathoms when the anchor holds, and then securing with a landfast or stern anchor. During the "Selatan" (strong southerly winds) sailing vessels will experience difficulty in making the road, as the sea breeze frequently sets in very late in the day-time.

Half a mile north-westward of the mouth of the Rano Rapo, near the coffee warehouse, there is another very secure anchorage, taking care during the "Selatan" season to bring a stern fast to the reef to southward.

Amurang (Lat. 1° 12' N., Long. 124° 34' E.), the seat of government of the State of that name, lies on the right bank of the mouth of the Rano Rapo, the principal river in Amurang bay. The town is regularly built with white wooden houses, intersected by well-kept roads and paths. Near the shore are the remains of the old Lunet with a flagstaff. The flagstaff of the Contrôleur's house is not visible from the bay. A covered wooden bridge over the river connects Amurang with Rumöön. There is a good carriage road close along the beach to Tumpaän, and from there in an easterly direction to Tondano, a town of over 10,000 inhabitants situated on the north side of Tondano lake. The population of Amurang is about 2,000.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Amurang every four weeks on the Surabaya, North Celebes, Tomini gulf route; also every four weeks from Makassar.

Chart 2575, Eastern part of the Celebes sea.

Coast.—From Tanjong Walentau to Mariri, 18 miles to the south-westward the hills run close along the coast (except by the Sungi Poigar, where there is a low plain), with a strip of land in front clothed with mangroves and trees standing in the water. Tanjong Bojong, with a hillock about 100 feet high on it, is especially remarkable. Other conspicuous mountains are a 2,055-foot summit eastward of Tanjong Bojong, Lolombulan and Sinong Sajan, 4,625 and 3,415 feet high, respectively, and the rounded hill Mariri, 1,540 feet. Between Tanjongs Walentau and Nonopang the coast is clear; two reefs of 3½ and 2½ fathoms lie 1½ miles and one mile off the latter point. Eastward of Tanjong Lobu is a rock above water surrounded by a drying reef.

Anchorage.—There is anchorage before the mouth of the Sungi Poigar in 30 to 35 fathoms, about 2 cables from the shore. Also off the village Poigar, situated in a small bay a mile to the northward, in 36 to 40 fathoms, the same distance from the shore.

General charts 2575, 942a, 1263.

Plan of Bolang Bangka point to Moriri point on 2194. Var. 2° 30' E.

Bolang Mongondo road.—Bolang Mongondo, the principal place of the district of that name, has a very prosperous appearance, numbering 30 to 40 houses, with a population of about 1,000. The village is built in three long rows, and the zinc roofs of the houses are easily seen from seaward.

Abreast the village there is good anchorage in 18 to 20 fathoms, about 3 cables from the shore, although open to westerly winds, and a heavy sea will then prevent communication with the shore. Northward of the road a line of reefs, some of which partly dry, runs parallel with the coast over a distance of about 4 miles; from eastward it is advisable to pass outside these reefs unless possessed of local knowledge. The foot of the hills Banka and Ompu close together, with the right side of Mount Bokki above, bearing 235° true, will lead between the reefs and the coast, but this mark is seldom plainly seen.

Beacon.—A screw pile beacon, with white ball, marks the edge of the drying bank off the mouth of the river; this bank is gradually working out, and the reef northward of it partly dries at low water.

Chart 3195, Panang to Pulo Motuo.

The coast from Bolang Mongondo to Kwandang bay, a distance of 73 miles in a westerly direction, is high, mountain ridges with many conspicuous summits, affording good bearing points, rising at a short distance inland. Inside the 100-fathoms line, which extends from 5 to 10 miles off-shore, the depths decrease gradually, but the bottom is very irregular.

Molosso, a low island, lies 2 miles off-shore at 7 miles westward of Tanjong Banka.

A 1½-fathom patch lies 3 miles, and a 6-fathom patch 5½ miles, north-westward of Tanjong Banka.

A 1½-fathom patch lies 1½ miles south-westward, and a 6-fathom patch 2 miles north-westward of Molosso.

Plan of Bolang Uki bay on 2194.

Bolang Uki bay (Lat. 0° 51' N., Long. 123° 57' E.), 15 miles westward of Bolang Mongondo, affords very good and sheltered anchorage for a large number of vessels, with protection from the strong westerly winds. The high islet Tikus, covered with trees and shrubs, lies on the east side of the entrance; a steep, partly-drying reef projects 2 cables from its southern side. With the exception of a shoal of 5½ fathoms 4 cables to the south-westward of Tikus island, and a drying reef 2 cables off Tanjong Lingkot, on the south side, there are even depths from 16 to 10 fathoms. There is anchorage in about

General charts 3195, 2575, 942a, 1263.

Plan of Bolang Uki bay on 2194. Var. 2° 30' E.

13 fathoms off Labuan Uki, on the north side of the bay; the passage in is between Tikus island and the $5\frac{1}{2}$ -fathoms reef. View at page 544.

Chart 3195, Panang to Pulo Motuo.

Pulu Tiga lie 6 miles west of Bolang Uki bay, and consist of the three wooded islets Paniki, 310 feet high, Tenga, 369 feet, and Tundonia, 231 feet. They are surrounded by partly-drying reefs; in the narrow passage between Tenga and Tundonia are 24 fathoms water, and between Tundonia and the coast 18 to 24 fathoms. In the latter passage a reef of one fathom water lies 2 cables from the coast.

Plan of Domisil bay on 2194.

Domisil bay, south-westward of Paniki, is half a mile wide at the entrance, and penetrates $1\frac{1}{2}$ miles to the southward; it affords sheltered anchorage in the upper part from all winds except N.N.W. to north. The shore of the bay is fringed by a narrow drying reef, very steep-to at the entrance; half a mile southward of the eastern entrance point is a detached drying reef.

Chart 3195, Panang to Pulo Motuo.

Shoal.—A 7-fathom patch lies close to the 100-fathoms line 5 miles north of Tanjong Binta, 9 miles westward of Domisil bay.

Reefs.—From off Tanjong Buhabak (*Lat.* $0^{\circ}55'N.$, *Long.* $123^{\circ}27'E.$) a number of reefs and small islands lie within the 100-fathoms line extending as far as Kwandang bay. Beontong, the eastern of these, with 2 fathoms water, lies 3 miles north-eastward of Tanjong Buhabak, and $1\frac{1}{2}$ miles further westward are the Alanga reefs, which dry at low water. The Josina reefs, in long. $123^{\circ} 10' E.$, are two shoals of $2\frac{1}{4}$ and $2\frac{3}{4}$ fathoms, with Bangkil, a low wooded islet, westward of them.

Anchorage.—Off Bolang Itam, about 26 miles westward of Domisil bay, a broad bank of mud and stones extends; there is anchorage here in 13 fathoms water. Miangah, with $3\frac{1}{2}$ fathoms water, lies $1\frac{1}{2}$ miles northward of Bolang Itam. There is also anchorage off Kaidipang, a village of about 500 inhabitants $2\frac{1}{2}$ miles further westward, in about 9 fathoms, sand.

Labuan Broko lies just west of Kaidipang and 2 miles southward of the high Tanjong Dulang; the anchorage is southward of the cliffy northern entrance point in 5 to 6 fathoms, sheltered from westerly winds. The islets Damar and Nanggulet lie on an extensive reef projecting westward from Tanjong Lobok, forming the east side of the bay; southward of these islets is a basin about 3 cables broad, with

General charts 3195, 2575, 942a, 1263.

Chart 3195, Panang to Pulo Motuo. Var: 2° 30' E.

depths of $1\frac{1}{2}$ to $2\frac{1}{4}$ fathoms, entered through a narrow passage of $1\frac{1}{4}$ fathoms least water. Small craft will lie here entirely sheltered.

Telok Buku, 5 miles westward of Tanjong Dulang, is entirely open to north-west winds, and unsafe during the north-west monsoon. The shore is fringed by a drying reef, steep-to on the north-east side; on the south-west side and the back part of the bay the depths decrease gradually. Lolombatto reef, of half a fathom of water, lies half a mile to the south-westward of Tanjong Belongkoh, the eastern entrance point; in the inner part of the bay is a reef of one fathom least water, and further in a drying bank. The village Buku is situated on the western entrance point, and $1\frac{1}{2}$ miles further westward is the village Kota Jin on the mouth of the Sungai Andagileh.

Plan of Himana bay on 2194.

Himana bay (*Lat. 0° 55' N., Long. 123° 5' E.*).—The entrance to this bay is only 3 cables wide, but inside it broadens out to a circular basin about a mile in diameter, with depths of 5 to 7 fathoms; the inner part of this is, however, greatly taken up by a bank of sand, mud, and stones, which partly dries. A detached drying reef lies on the east side, and in the small space westward there is sheltered anchorage from all except northerly winds. A couple of rivulets discharge in the bay, and the village Himana is situated on the south shore.

Chart 3195, Panang to Pulo Motuo.

KWANDANG BAY, between Tanjongs Besar and Dondo, is full of islets and reefs, but the latter can generally be seen by discoloured water, and three of them are marked by beacons. Most of the islets are fairly high and closely wooded, and several of them are inhabited; Pulo Motuo, by the western entrance point, has a densely wooded summit 860 feet high.

LIGHTS.—A *white flashing light every three seconds*, showing a flash of *one second* duration, is exhibited, at an elevation of 49 feet above high water, from the centre of Hulawa islet (*Lat. 0° 58' N., Long. 122° 54' E.*), 3 miles westward of Tanjong Besar. It is visible from a distance of 12 miles.

A *red fixed light* is exhibited, at an elevation of 20 feet above high water, from the cable house on the shore eastward of the Sungai Kwandang; it is visible from a distance of 5 miles.

For the arcs of visibility, *see* Light list and chart.

Beacons.—A beacon with black truncated cone stands in 2 fathoms water on the south edge of Antoinette reef, 2 miles south-

General charts 942a, 1263.

Chart 3195, Panang to Pulo Motuo. Var. 2° 30' E.

westward of Tanjong Besar. A beacon with white ball marks the north edge of the Phoenix reef, in the entrance to the anchorage, and a beacon with black truncated cone marks the south side of the drying reef about $1\frac{1}{2}$ miles northward of Otangala island, westward of Payunga.

Anchorage.—The anchorage is on the east side of the island Payunga, in depths of 6 fathoms and more, and is safe in both monsoons. The village Kwandang is a little distance inland, and cannot be seen from out at sea; there is a road fit for horses to Gorontalo, which can be reached in about 7 hours. Provisions cannot be obtained.

Prohibited anchorage.—Anchorage is prohibited within 3 miles of the cable house (*Lat. 0° 52' N., Long. 122° 55' E.*) between 168° true, through south, to 188° true.

Directions.—From eastward the passage to the anchorage of Kwandang is between Hulawa and Huha, and then along the Antoinette and Phoenix reefs. Merapi, of $3\frac{1}{2}$ fathoms water, lies $3\frac{3}{4}$ miles to the north-eastward of Huha, and a large reef in the shape of a horseshoe, with a least depth of $1\frac{3}{4}$ fathoms, extends from the north side of Hulawa. Haarlemmermeer, 3 miles further north-westward, has a depth of $1\frac{3}{4}$ fathoms on its eastern end. From westward vessels may pass either north or south of Pulo Papaja and Pulo Motuo, and thence between Otangala and the reef northward. In the passage southward of Papaja and Motuo are two reefs of less than 6 feet water. Laimula reef, with $3\frac{1}{2}$ fathoms water, lies $2\frac{1}{2}$ miles northward of Pulo Motuo.

Communication.—Vessels of the Royal Netherlands Steam Packet Company visit Kwandang every fortnight on the Surabaya, North Celebes, Tomini gulf route. Also every four weeks from Makassar to Menado and back, calling both ways.

Telegraph.—The cable between Menado and Balik Papan is landed at the head of the bay between Payunga and the main coast.

Plan of Sumalata road on 2194.

Sumalata road, 8 miles westward of Pulo Mutuo, affords very good anchorage in the south-east monsoon, and fair anchorage in the north-west monsoon. The road is protected from easterly winds by the wooded Pulo Dojanumo and the reef southward of its east point; a mile north-westward of the island is the islet Ulawa, and three-quarters of a mile north-eastward a large reef drying at low water. In the north-west monsoon there is safe anchorage in 17 fathoms southward of Pulo Dojanumo, with a hawser to the shore. Loading and unloading is carried on by lighters; in bad weather and a heavy

General charts 1153, 942a, 1263.

Plan of Sumalata road on 2194. Var. 2° 30' E.

sea the cargo is first taken to Dojanumo, and afterwards transported to Sumalata. There is a wooden pier at Sumalata, but it has no steps.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Sumalata every four weeks on the voyage from Makassar to Menado, both outward and return.

Chart 1153, Pulo Motuo to Tanjong Lutuno.

Buliogut and Bulolio reefs, the only dangers outside the 100-fathoms line, are two large sand and coral reefs, 5 to 6 miles off-shore, between Tanjongs Sumalata and Buloli. They are steep-to, and dry at low water.

LIGHTS.—A *red occulting light every four seconds*, thus:—light, *two seconds*; eclipse, *two seconds*, is exhibited, at 36 feet above high water, from a white iron frame lighthouse on the north-east point of Buliogut reef (*Lat. 1° 8' N., Long. 122° 26' E.*); it is visible from a distance of 10 miles.

A *white flashing light every four seconds* is exhibited, at an elevation of 38 feet above high water, from a white iron framework situated on the north-west point of Bulolio reef; it is visible from a distance of 10 miles.

Coast.—Between Tanjongs Sumalata and Lobu, 24 miles westward, the coast forms a large number of small bights and inlets, separated by high points projecting far into the sea, spurs from the lofty mountains. Within the 100-fathoms line the depths rapidly decrease, and the bottom is irregular. At a distance of 2½ miles, 300° true, from Tanjong Sumalata is a reef of 5 fathoms least water, and a reef of 2½ fathoms lies 3 miles, 298° true, from the 807-foot hill on Tanjong Buloli; the other banks all have 8 fathoms or more water over them. Pulo Bulaelo, 2½ miles westward of Tanjong Buloli, is surrounded by a drying reef, and Pulo Tolengula, 196 feet high, 5 miles further, has a drying reef projecting half a mile from its north point.

Plan of Paleleh and Lintidu roads on 2194.

Paleli (Paleleh) road.—The village Paleli, 5½ miles westward of Tanjong Lobu, where the Government official of the under-state Buwul resides, is situated on the west side of the large bay between Tanjongs Lobu and Kanjai; the coast village Lintidu lies northward of Paleli, and a short distance inland are the mines of the Paleli Mining Company. Pulo Paleli lies abreast the high tongue of land between Paleli and Tang villages; it has a hill 98 feet high near the south point, and is surrounded by a partly drying reef.

The best anchorage is southward of the islet Jelesma, south of Paleli, although care must be taken not to approach too closely on account of the shoal water extending a quarter of a mile from it. At

General charts 1153, 942a, 1263.

Plan of Paleleh and Lintidu roads on 2194. Var. 2° 30' E.

the entrance to the bay are Lobu bank of 7 fathoms least water, one mile north-westward of Tanjong Lobu, Tanoala, of 3 fathoms, one mile further westward, and Bulilanga, of 4 fathoms, 1½ miles northward of Pulo Paleli; they are all clearly marked by discolouration. A small patch with 3 fathoms water lies 10½ cables, 99° true, from the south point of Pulo Paleli.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call at Paleli every four weeks on the Surabaya, Makassar, North Celebes, Gulf of Tomini route. Also every four weeks from Makassar to Menado, both ways.

Chart 1153, Pulo Motuo to Tanjong Lutuno.

Coast.—From Tanjong Kanjai the coast trends in a westerly direction for 24 miles, to Tanjong Tang, and then curves to the north-eastward and northward for 14 miles to Tanjong Kandi. The Paleli mountains rise at a short distance from the coast between the two first named points; the highest summit attains a height of 7,545 feet. Near Buwul, 7 miles north-westward of Tanjong Tang, the coast is somewhat low. Midway between Tanjong Kanjai and Buwul the coast forms two small inlets, Lokodoko and Lokodidi; these are, however, of little importance, and the entrances are very narrow; a reef of 2 fathoms water lies in the middle of Lokodoko, the eastern bay. Close to the coast, between the bays, there is a wooded hill 443 feet high, affording a good landmark. Between Tanjong Kanjai and Lokodoko several reefs, consisting of sand and coral, lie inside the 100-fathoms line. Westward of Lokodoko there are no dangers.

Pulo Raja and Pulo Bokki (*Lat. 1° 6' N., Long. 121° 49' E.*) are two low, bare islets of sand and coral, surrounded by extensive drying reefs; there is a safe passage between them, as the reefs are sharply defined by discolouration. Karang Belanda, a rock above water, surrounded by a reef, lies 3 miles eastward of Pulo Raja.

Buwul road.—Buwul, the residence of the native prince of the district, is situated at the mouth of a rivulet in a swampy plain enclosed by mountains; the houses are built on piles, and are mostly very large, with peculiarly decorated fronts. A large house with zinc roof, and the flagstaff, are conspicuous. Round hill, 1,491 feet high, south-westward of Buwul, is a good landmark. Anchoring in 30 fathoms vessels will lie about half a mile from the shore; it is not advisable to approach in less than 15 fathoms, as inside that the depths decrease rapidly. A drying bank extends 2 cables before the mouth of the rivulet, and at low water the mouth cannot be reached. In easterly winds the road is unsafe. Good water can be obtained from the river.

Communication.—Vessels of the Royal Netherlands Steam Packet Company call every four weeks at Buwul, on the voyage from Makassar to Menado and back.

General charts 1153, 942a, 1263.

Chart 1153, Pulo Motuo to Tanjong Lutuno. Var. $2^{\circ} 30' E$.

Tanjongs Kandi and Kramat are the north-east and north extremities of a high promontory; the coast reef is narrow here and anchorage in 10 to 20 fathoms may be had at a suitable distance from the shore. Pulo Gantale, immediately eastward of Tanjong Kandi, is a high rock, with little vegetation, and is very remarkable; there is often a strong current here, and a short turbulent sea. Round hill, 1,545 feet high, is a useful bearing point. Bilang bay, on the southern side of the peninsula, is almost taken up by a drying part projecting from the shores. Karang Pantuluta, with 6 fathoms water, lies $1\frac{1}{2}$ miles south-eastward of Gantale.

Coast.—From Tanjong Kramat the coast turns to the south-eastward for $5\frac{1}{2}$ miles to Tanjong Kano, and is generally high; spurs from the mountains run to the coast, and form more or less noticeable points with strips of sand between. Makopo village is situated in a wide bight eastward of Tanjong Kano; the coast reef is very broad here. Close to the coast north-eastward of Makopo is a sharp-pointed hill, 1,132 feet high; the land between this hill and Tanjong Kramat appears as an island from a distance westward.

Busak bay, between Tanjongs Kano and Lutuno, 2 miles westward, is a fairly spacious bay, with good anchorage in 10 to 20 fathoms, although entirely open to northerly and north-westerly winds. Heavy squalls may come at any time in the year from the north-west, quickly raising a heavy sea and surf. In the eastern part of the bay is a coral reef of half a fathom water, and in the western part a reef of one fathom; both reefs are very small, and not always visible by discolouration. A rivulet discharges in the bay, but is too shallow to be of any importance to shipping. There is a white pyramid with cross (*Lat. $1^{\circ} 15' N.$, Long. $121^{\circ} 22' E.$*) eastward of the mouth of the river. The best anchorage is in about 14 fathoms, with the pyramid bearing 176° true, distant 4 cables.

Pulo Busak, a heavily timbered, rocky island before the entrance to the bay, is 246 feet high, and surrounded by a narrow reef except on the north-west side; outside the reef there is deep water. Two shoals of one to 3 fathoms, separated from each other by depths of 20 to 24 fathoms, lie from one to 3 miles north-eastward of the island.

Directions.—To enter Busak bay from eastward it is advisable to pass northward of Pulo Busak and the reefs eastward, unless they can be clearly seen; vessels will be clear of these reefs as soon as the white pyramid comes in line with the east side of the island. From westward a very remarkable valley in the high mountains inland, bearing 112° true, may be steered for, and for the anchorage when the pyramid bears 162° true. A remarkable tree on the west side of the bay affords a good bearing point.

General charts 942a, 1263.

Chart 3394, Tanjong Lutuno to Dondo point. Var. 2° 30' E.

Coast.—From Tanjong Lutuno the coast runs with a slight curve in a west-by-north direction to Tanjong Takudan, a distance of 15 miles. The eastern part is clifly, with sand beaches between the rocky points; the western part is low and flat. Three streams discharge in the low part, the Lakea, Lakoang, and Binangtuan; some detached rocks lie on the coast reef by the mouth of the Lakea, which indicate its position. There are no dangers on this part of the coast, and anchorage may be found everywhere; the depths, however, rapidly decrease inside the 20-fathoms line. A narrow reef of live coral fringes the coast.

Tanjong Takudan (Boschkaap) (*Lat. 1° 19' N., Long. 121° 6' E.*) is a high cape rising steeply out of the sea. It can be recognised from a great distance by some yellow patches in the forest which covers the mountains on the coast. Several detached rocks lie at the foot of the cape.

Plan of Pienschang bay on 2194.

Pienschang bay, westward of Tanjong Takudan, and protected by the islets off the entrance, affords a very good anchorage. The Pienschang islands are two small rocky islets with several detached rocks, surrounded by a drying reef. The small village Pienschang is situated on a rivulet with depths of one to 1½ feet in it at low water; the anchorage is northward of the village in 20 to 25 fathoms, sand, and is well sheltered from northerly and north-westerly winds. In a heavy sea in the north monsoon there is better shelter under the islets.

Chart 3394, Tanjong Lutuno to Dondo point.

The coast between Pienschang and Belonlioh bays, a distance of 8 miles, is high and rocky except by Tanjong Bonto, at the entrance to the latter, where there is a low part; a number of ridges from the mountains form capes, with sand beaches between. Tanjong Koko can be recognised by two large rocks in the water near the beach. Anchorage may be found everywhere along this part of the coast in 10 to 20 fathoms; the depths increase rapidly outside the 20-fathoms line.

Julih is a flat rock about 30 yards in diameter, with a small part in the middle about 10 feet above water; it lies about 1½ miles eastward of Tanjong Koko, abreast Julih village, and is surrounded by a coral reef with depths of 3 to 10 fathoms over it. The passage between the reef and the coast is clear, and by keeping the shore side a least depth of 14 fathoms will be found.

Plan of Lingadang road and Belonlioh bay on 2662.

Reefs.—Immediately eastward of Tanjong Bonto, and half a mile off-shore lie two reefs, with 2½ fathoms over the western and

General charts 3394, 942a, 941b, 1263.

Plan of Lingadang road and Belonlioh bay on 2662. Var. 2° 30' E. 3½ fathoms over the eastern. The passage between these reefs and the coast is clear, but it is advisable to pass outside them.

Belonlioh bay, between Tanjong Bonto and Pulo Dalangan, has the character of a fiord. The village Belonlioh is situated on a narrow tongue of land on the eastern side of the bay, and the village Sentigi on a sandy point opposite. Between Tanjong Bonto and Belonlioh village the shore is low and partly clothed with mangroves. The west and south shores of the bay are hilly and densely wooded. Southward of Belonlioh is Telok Assaän, a small inner bay divided into two basins by a coral reef projecting from a very conspicuous mangrove point; the northern of these provides little room for a vessel, but there is swinging room in the southern. Telok Anchur Banju, on the opposite shore, is completely filled in by a coral reef. The channel continues in a south-south-westerly direction from these two bays, and then penetrates inland with three arms, but these are too obstructed with reefs to be of any importance to shipping.

A reef of 5 fathoms water lies in the middle of the entrance to Belonlioh bay, with Tanjong Sentigi bearing 239° true, distant 5½ cables. There is very good sheltered anchorage in 20 to 25 fathoms, about midway between Sentigi and Belonlioh villages; there is anchorage for small vessels in Telok Assaän, southward of Belonlioh, in 18 fathoms, mud. Northward of Sentigi there is a conspicuous hill with a sharp summit 670 feet high, that affords a good bearing point from east or west.

Directions.—To enter Belonlioh bay steer for Tanjong Sentigi on the bearing 190° true, and when the south side of Pulo Dalangan touches the main coast alter course to 160° true, between the coast reefs on both sides, and avoiding the reef of 5 fathoms water. When Tanjong Sentigi bears 262° true round the coast reef on the west side of the channel and steer for the anchorage with course 227° true. The depths in the channel vary from 40 to 20 fathoms.

Pulo Dalangan (Lat. 1° 22' N., Long. 120° 54' E.), 3 miles westward of Tanjong Bonto, is a flat, thickly-wooded island, 147 feet high, visible in clear weather about 16 miles, and very conspicuous from east and west. It consists of thrown-up coral, and is surrounded by a reef which connects it to the main coast; this reef is very steep on the north side. A very slight wind causes a troubled sea outside Dalangan, with some smooth places having an oily appearance. There are some places with deep water on the reef joining Dalangan and the main coast, but owing to a higher ridge on the edge of the reef these can only be entered by small native boats at high water.

General charts 3394, 2636, 942a, 941b, 1263.

Plan of Lingadang road and Belonlioh bay on 2662. Var. 2° 30' E.

Lingadang road (Lat. 1° 20' N., Long. 120° 52' E.) is a basin in the coast reef entered by a narrow channel 2½ miles south-westward of Pulo Dalangan. The village Lingadang is situated on the southern shore, and a detached reef, partly awash at low water, lies northward of the village. There is sheltered anchorage from all sea either north or south of this reef, and with good sight of the reefs steam vessels can enter without danger.

For the west coast of Celebes northward to Tanjong Besar, *see* pages 381-422.

General charts 3394, 2636, 942a, 941b, 1263.

APPENDIX I.
PARTICULARS OF DRY DOCKS, PATENT SLIPS, &C.

Port.	Name of Dock.	Length.		Breadth of Entrance.	Depth at H. W. O. S.		Lifting Power.	Date Built.	Remarks.
		On Blocks.	Over all.		On Sill.	On Blocks.			
BATAVIA	Tanjong Priok Floating Dock.	Feet —	Feet 324	Feet 67	Feet 24	Feet 22	Tons 4,000	1896	
	Patent slip	264 (cradle)	—	—	Forward Aft	11 } 19 }	2,000	—	
SURABAYA	Government Floating. No. 3.	—	459	82	—	24½	14,000	1913	
	" "	—	322	62	22½	—	4,800	1881	
	" "	—	196	59	16	—	1,350	1888	Towed from one place to another as required.
	Patent Slip	—	200 {	Forward Aft	8 } 12 }	—	700	—	
	" "	—	80 {	Forward Aft	6 } 10 }	—	150	—	There is also a mud dock 600 feet in length and 80 feet in breadth at entrance, with 15 feet on sill, used for repairing the floating docks.
	Torpedo Boat Slip ..	—	110	—	12	—	200	—	

APPENDIX II.

LIST OF PRINCIPAL PORTS, SHOWING PARTICULARS
OF DEPTHS, &c.

Port.	Depth at L.W.O.S. in channel of approach.	Depth at L.W.O.S. in anchorage.	Rise of Tide.	Remarks.
BALIK PAPAN	4 fathoms.....	6 to 12 fathoms	Feet 5 to 9	Safe harbour at all seasons.
BANJERMASIN	6½ feet on bar at entrance to Barito river.	.....	5 to 7	When over the bar vessels drawing 12 feet can reach Banjarmasin at all times.
BANJUWANGI	5 fathoms.....	7 to 9 fathoms	5	Good anchorage for a limited number of vessels in N.W. monsoon.
BATAVIA— Inner or Dutch channel.	7 to 12 fathoms	5 to 6 fathoms in Old road.	3	Good holding ground, but considerable sea in N.W. monsoon.
Outer channel	14 to 30 fathoms	5½ to 7 fathoms in New road.		
Tanjong Priok harbour— Outer harbour	.....	24½ to 28 feet	—	Enclosed by breakwaters. Two lines of mooring buoys.
Inner harbour	.....	24½ feet	—	Depth alongside coal wharves 22 to 23 feet.
CHEMBON	3½ fathoms over Cheribon bank. 5½ fms. through buoyed channel	3 to 4 fathoms	2½ to 3	Good anchorage in N.W. monsoon.
CHILACHAP ..	4 to 8 fathoms	4½ to 6 fathoms	6	Sheltered at all seasons. Depth alongside loading quays 15 feet.
MAKASSAR	6 to 10 fathoms	7 to 10 fathoms	5½	Safe anchorage at all seasons. Mooring buoys laid out.
SEMARANG	Decreases gradually from 20 fathoms.	3 to 6 fathoms	2½	Open to winds from N.N.E. to West.
SURABAYA— North channel	20½ feet	3½ to 8 fathoms	6	Vessels of sufficient engine power and with draughts exceeding the depth by 3 feet can go through the mud without danger in North channel.
East channel	12 feet	.....	9	

APPENDIX III.

The upper figures denote the average number of days on which rain fell, the lower give the mean rainfall in inches.*

Place.	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
JAVA, NORTH COAST.													
BATAVIA	21 12·8	17 11·5	17 10·0	12 5·1	9 3·7	8 3·3	5 2·6	4 1·2	7 3·9	9 4·3	12 5·1	15 7·4	136 70·9
INDERAMAYU	15·3 12·5	14·3 9·8	13·3 6·4	11·4 6·1	9·5 4·5	7·3 3·7	5·6 3·3	2·5 1·3	2·9 1·4	5·7 2·4	8·9 4·9	15·2 7·8	111·9 64·1
CHERIBON	21·9 17·4	19·3 15·0	18·4 14·4	12·2 7·8	8·6 5·2	7·9 4·2	5·4 2·8	2·9 1·6	2·8 1·2	5·0 2·4	9·7 6·0	18·9 14·8	133 92·8
TEGAL	16·2 13·8	15·5 13·3	12·0 9·4	7·4 4·9	5·7 3·5	5·3 3·8	4·4 3·1	2·4 1·4	2·3 1·2	3·6 1·7	7·0 5·2	13·6 11·8	95·5 73·1
PEKALONGAN	21·3 19·3	19·8 16·3	15·6 9·1	12·5 6·4	9·4 4·0	7·9 4·2	6·6 3·4	6·7 3·2	5·5 2·6	7·4 3·7	11·1 4·5	18·1 10·7	141·9 87·4
SEMARANG	21·4 15·0	19·3 14·1	17·0 9·0	14·1 7·5	10·4 5·0	7·4 3·3	5·6 3·1	5·0 2·5	6·1 3·7	10·3 5·3	15·6 7·3	19·3 10·0	151·5 85·8
REMBANG	16·4 10·3	10·9 8·5	11·2 7·8	7·8 4·2	6·2 3·2	5·5 3·4	2·9 1·5	2·4 1·0	2·6 1·3	4·4 2·0	9·1 4·9	14·4 8·8	96·8 56·9
SURABAYA	18·7 12·2	18·4 11·2	16·4 10·3	13·4 6·5	9·0 4·3	6·9 3·2	3·8 2·0	1·8 0·8	0·9 0·5	2·8 1·5	8·5 4·5	16·9 9·5	118·3 66·5
PASURUAN	16·7 9·0	18·1 10·3	14·6 7·9	9·5 5·1	6·1 3·0	4·9 2·4	2·0 1·0	0·7 0·3	0·4 0·1	1·0 0·5	4·8 2·2	13·9 6·5	92·7 48·3
PROBOLINGO	15·1 9·1	14·8 9·6	11·3 6·1	7·2 4·4	5·2 2·4	3·9 1·7	1·4 0·8	1·0 0·4	0·3 0·1	1·3 0·5	4·6 2·4	12·9 6·4	79 43·9
SUMENEP (Madura)	16·7 10·4	14·6 10·9	14·8 10·2	10·1 6·9	7·8 4·7	6·4 3·8	3·2 1·9	1·1 0·3	0·7 0·3	1·9 1·1	8·0 3·6	15·7 10·3	101 64·4
JAVA, SOUTH COAST.													
CHILACHAP	18·9 11·6	16·7 9·8	17·4 12·2	17·9 11·1	14·4 11·0	13·6 13·0	12·7 10·6	10·8 8·3	10·7 8·6	17·1 17·0	21·1 19·9	121·0 15·4	192·3 148·5
PACHITAN	20·2 14·3	21·7 14·2	18·6 10·9	10·9 5·9	8·0 5·0	7·1 5·6	5·5 2·6	4·3 1·8	4·9 2·3	9·6 8·1	14·7 13·5	19·5 15·2	138·6 99·4
ISLANDS EAST OF JAVA.													
BULELENG (Bali)	16·3 9·0	16·1 9·2	13·5 7·5	9·5 4·2	5·3 2·5	3·8 1·6	1·7 0·6	1·0 0·2	0·6 0·1	1·7 0·5	7·6 2·8	15·2 7·2	92·3 45·4
AMPENAN (Lombok)	11·3 7·2	11·4 7·1	9·2 7·0	6·4 3·6	4·0 2·3	3·2 2·6	3·5 2·0	2·4 1·6	2·0 1·7	6·3 4·8	9·5 5·7	16·5 11·3	85·7 56·9

* Taken from the *Zeemansgids voor den Oost Indischen Archipel*, Part III., 1909, and Part IV., 1912

Place.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
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ISLANDS EAST OF JAVA—*continued.*

BIMA (Sumbawa)	15.0	14.6	12.2	8.7	4.9	3.8	1.4	0.9	1.5	3.6	10.4	14.4	91
	8.3	7.6	7.2	5.6	2.3	1.4	0.7	0.3	0.6	1.3	4.9	7.9	48.1
KOMPANG (Timor)	17.6	15.9	12.1	5.0	3.0	1.0	0.7	0.3	0.3	1.2	7.5	14.8	79.4
	16.6	15.0	8.7	2.4	1.3	0.3	0.2	0.1	0.1	0.4	6.9	9.8	61.8

BORNEO, SOUTH AND EAST COASTS.

BANJERMASIN ..	22.7	20.5	20.2	15.4	13.7	12.6	9.9	10.0	7.8	12.0	16.3	21.9	183
	12.5	11.5	12.2	8.4	6.7	5.9	4.1	3.9	3.5	5.8	8.5	13.2	96.2
BALIK PAPAN ..	13.4	13.9	14.3	11.9	11.0	10.5	11.1	12.5	9.1	10.6	12.6	14.9	145.8
	7.8	9.3	9.5	7.9	8.0	7.8	9.4	5.8	5.4	5.4	7.3	8.5	92.1

CELEBES, WEST AND SOUTH COASTS.

DONGALA	11.2	11.5	10.1	7.9	7.7	10.0	9.1	7.2	6.1	6.1	7.2	11.0	105.1
	7.4	6.9	6.2	3.7	3.6	4.5	4.4	4.1	2.5	2.2	2.4	6.7	55.6
MAKASSAR	24.9	20.9	18.9	10.9	7.5	6.9	4.6	1.9	1.9	4.2	11.6	22.6	136.8
	28.7	21.7	17.5	5.7	3.3	3.4	1.6	0.4	0.5	1.5	7.0	25.2	116.5
ALLU	17.6	15.7	12.6	7.9	6.3	5.5	2.9	1.0	1.0	2.5	8.6	7.1	98.7
	18.3	18.7	10.5	4.8	3.3	2.7	1.5	0.8	0.8	1.9	5.9	16.7	85.9

CELEBES, EAST AND NORTH COASTS.

POSO	10.2	11.2	10.2	11.8	12.8	12.7	11.5	9.0	7.9	8.9	8.5	10.4	125.1
	7.0	7.8	8.8	8.9	9.6	7.7	8.5	5.8	5.2	6.0	5.5	6.0	86.8
GORONTALO	8.9	8.0	8.6	9.7	9.4	10.2	7.9	7.6	4.0	5.7	8.1	11.0	99.1
	4.2	4.1	4.0	5.0	4.1	4.8	3.8	3.5	1.8	2.7	3.8	5.2	47.0
MENADO	21.3	18.7	17.0	13.9	13.4	13.2	9.9	9.8	7.6	10.8	14.4	19.8	169.8
	18.1	14.3	11.5	8.1	6.3	6.5	5.1	4.2	3.3	4.8	8.5	14.7	105.4
KWANDANG	13.0	12.5	9.7	9.0	10.9	10.3	7.2	6.8	5.6	9.1	11.3	12.6	118
	11.1	9.8	7.0	6.0	7.1	6.8	4.8	4.3	3.2	5.7	8.4	10.0	84.2

APPENDIX IV.

Reliable magnetic observations have been made at the following places (spots), and the positions indicated should, whenever practicable, be re-occupied in making future observations.

Corrections, or additional information, should be forwarded to the Hydrographer of the Navy, and accompanied by a small tracing from the chart showing the exact position.

BATAVIA	Lat. 6° 7' 40" S.	Long. 106° 48' 36" E.	Magnetic observatory.
BIMA, Sumbawa	Lat. 8° 26' 45" S.	Long. 118° 42' 53" E.	At extreme end of path leading from near Fort to landing place.
COCOS ISLAND	Lat. 12° 6' 10" S.	Long. 96° 53' 30" E.	On summit of Pulo Bras, a sand dune. Point, New Selim island, 140° 46' true.

Abnormal value of the magnetic variation has been reported at the following place; attention should therefore be given to the indications of the compass when navigating in its vicinity.

SUMBAWA ISLAND.....Off Tambora volcano.

PLACE—COCOS or KEELING ISLANDS. OBS. Δ LAT. $12^{\circ} 5' 24''$ S., LONG. $96^{\circ} 53' 30''$ E.
METEOROLOGICAL TABLE COMPILED FROM 1 TO 10 YEARS' OBSERVATIONS.

NN

PLACE—CHRISTMAS ISLAND. OBS. Δ LAT. 10° 25' S., LONG. 105° 43' E.
METEOROLOGICAL TABLE COMPILED FROM 7 TO 9 YEARS' OBSERVATIONS.

MONTH.	BAROMETER. Reduced to 32° F. and Mean Sea Level.					AIR TEMPERATURE.								Relative Humidity		Cloud Amount, Scale 0 to 10.		RAIN.			WIND.								No. of Days Gale.	No. of Days Fog.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
	Mean.		Absolute.			Mean.				Absolute.				For Month.	Range.	Max.	Min.	Range.	Max.	Min.	Range.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.			Calm.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	For Month.	Daily Range.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.																			Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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PLACE—BATAVIA. OBS. Δ LAT. 6° 11' S., LONG. 106° 50' E.
METEOROLOGICAL TABLE COMPILED FROM 18 TO 35 YEARS' OBSERVATIONS.

MONTH.	BAROMETER. Reduced to 32° F. and Mean Sea Level.				AIR TEMPERATURE.								Relative Humidity Scale 0 to 10.		RAIN.			WIND.								No. of Days Gales.	No. of Days Fogs.										
	Mean.		Absolute.		Mean.				Absolute.				Range.	For Month.	Ins.	Range.	For Month.	Max.	Min.	Range.	Max.	Min.	Range.	N.	N.E.			E.	S.E.	S.	S.W.	W.	N.W.	alm.			
	For Month.	Daily Range.	Max.	Min.	Ins.	Range.	Max.	Min.	Range.	Max.	Min.	Range.																							Max.	Min.	Range.
January	29-81	0-12	30-04	29-61	0-43	78	—	—	—	9	92	69	23	87	8	13-78	23	9-48	1	4	1	0	0	0	2	5	7	12	—	—							
February	29-82	0-12	29-99	29-56	0-43	78	—	—	—	9	91	69	22	88	7	12-56	21	7-96	1	4	1	0	0	0	1	4	7	11	—	—							
March	29-81	0-13	30-02	29-61	0-41	79	—	—	—	11	91	70	21	86	7	7-52	17	5-16	1	4	2	1	0	1	2	4	5	12	—	—							
April	29-80	0-12	29-96	29-61	0-35	79	—	—	—	12	91	70	21	85	6	4-77	14	3-10	1	3	4	3	1	1	2	2	2	12	—	—							
May	29-80	0-12	29-96	29-60	0-36	80	—	—	—	12	91	70	21	84	5	3-47	9	3-01	1	3	6	4	1	1	2	1	1	12	—	—							
June	29-81	0-11	29-99	29-63	0-36	79	—	—	—	12	91	69	22	83	5	3-62	9	4-57	1	2	5	5	1	1	2	1	1	12	—	—							
July	29-82	0-11	30-02	29-63	0-39	78	—	—	—	13	90	67	23	81	5	2-52	7	4-16	1	3	7	5	1	1	1	1	1	11	—	—							
August	29-83	0-12	30-02	29-65	0-37	79	—	—	—	14	92	67	25	78	4	1-50	5	1-71	1	4	8	4	1	1	1	1	1	10	—	—							
September	29-83	0-13	30-00	29-67	0-33	80	—	—	—	14	94	66	28	78	5	2-72	7	2-36	1	6	6	3	1	1	1	1	1	10	—	—							
October	29-82	0-13	30-00	29-63	0-37	80	—	—	—	14	95	69	26	79	5	4-17	10	3-37	1	6	5	3	1	2	2	1	1	10	—	—							
November	29-81	0-12	30-00	29-60	0-40	79	—	—	—	12	96	68	28	82	7	5-08	14	3-39	1	4	3	2	1	2	3	3	2	10	—	—							
December	29-80	0-12	29-98	29-59	0-39	78	—	—	—	11	93	70	23	85	7	9-02	19	6-79	1	3	1	1	0	1	2	6	5	12	—	—							
Means	29-81	0-12	—	—	—	79	—	—	—	12	—	—	—	83	6	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—						
Totals	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	70-73	155	—	—	46	49	31	8	12	21	30	34	134	—	—	—						
Absolute Values	—	—	30-04	29-56	0-48	—	—	—	—	—	96	66	30	—	—	—	—	9-48	—	—	—	—	—	—	—	—	—	—	—	—	—	—					
No. of Yrs. Obsd.	—	—	35	—	35	—	—	—	—	—	35	—	—	—	21	37	18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—					

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